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The Impact of Chinese Import Penetration on Danish Firms and Workers*

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Abstract

The impact of imports from low-wage countries on domestic labor market outcomes has been a hotly debated issue for decades. The recent surge in imports from China has reignited this debate. Since the 1980s several developed economies have experienced contemporaneous increases in the volume of imports and in the wage gap between high- and low-skilled workers. However, the literature has not been able to document a strong causal relationship between imports and the wage gap. Instead, past studies have attributed the widening wage gap to skill biased technological change. This paper finds evidence for the direct impact of low wage imports on the wage gap. Using detailed Danish panel data for firms and workers, it measures the effects of Chinese import penetration at the firm level on wages within job-spells and over the longer term taking transitions in the labor market into account. We find that greater exposure to Chinese imports corresponds to a negative firm-level demand shock, which is biased towards low-skill intensive products. Consistent with this an increase in Chinese import penetration results in lower wages for low-skilled employees.

Keywords: Chinese import penetration, wage inequality, firm heterogeneity

JEL Codes: F16

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1 Introduction

In the last quarter century, the United States and several other advanced economies have experienced greater income inequality between skilled and unskilled workers. The simultaneous rise in imports from China and other developing countries triggered a lively early debate among trade and labor economists regarding the link between increased trade and the higher skill premium. One example is the survey by Freeman (1995) entitled "Are your wages set in Beijing?" This study concluded that increased trade contributed to, but was not the primary cause behind the rising wage gap. The skepticism was fueled in part by the fact that, in the mid 1990s, international trade still only constituted a small percentage of total consumption in most advanced countries, so the factor contents of trade constituted tiny fractions of the domestic supplies of labor.

Since then, the establishment of the WTO and trade liberalizations enacted during the Uruguay Round has led to a boom in imports from developing countries and from China in particular. This has once again ignited interest in studying the effects of imports on workers in advanced countries. For example, Krugman (2008) contends: "...there has been a dramatic increase in manufactured imports from developing countries since the early 1990s. And it is probably true that this increase has been a force for greater inequality in the United States and other developed countries." However, there is still a lack of studies documenting a causal relationship between increased import competition from low-wage countries and the skill wage gap.

Among low-wage countries, the rise of China has been remarkable. When the Chinese government enacted market reforms in 1978, China was the 11th largest economy in the world, accounting for only 2% of global GDP. Thirty years later, China has overtaken Japan as the second largest economy in the world, accounting for 10% of global GDP. Its growth rate over these decades have been unmatched by any other nation. Much of this economic success has been driven by international trade. Since opening its borders in 1978, China has grown from a closed economy to the world's largest exporter. This meteoric rise has created large variations in Chinese imports, making them attractive data for empirical studies such as this current paper.

In this paper we use matched worker-firm data from Denmark covering the universe of firms and workers merged with domestic sales by product for the period 1997–2008. We make three main contributions. First, we document that domestic firms are exposed to Chinese import penetration to very different degrees. For example, in many of the industries we examine, the firm at the 25th percentile of domestic sales by product is unaffected by Chinese imports while the 75th percentile firm has a Chinese import penetration measure over twice that of the median firm. This is in line with the literature on heterogeneous firms showing that firms, even within narrow industry classifications, differ with respect to, e.g. size, productivity, capital intensity, wages, exports and imports. In contrast, the traditional approach in the literature has been to assume that all firms within an industry are exposed to the same level of Chinese import penetration (allowing them to use industry-level measures of import penetration).

Second, we provide evidence for how firm-level Chinese import penetration correlates with domestic sales. We first decompose changes in firm-level domestic sales into increases or decreases in sales of products sold throughout the period as well as entry and exit of products. We then relate these components to changes in import competition and find that all three components contribute to lower domestic sales when the firm is exposed to increasing Chinese imports. In an extension we show that the skill intensity of products matter. Domestic sales in low-skill intensive products contract faster than high-skill intensive products in response to increased Chinese import penetration. This suggest that imports from China correspond to negative demand shocks with a bias toward low-skilled workers.

Third, we show a causal relationship between Chinese import penetration and the rising wage gap. We estimate within job spell wage equations using over time changes in the firm-level Chinese import penetration measure as the source of variation. We instrument for Chinese import penetration using China's world export supply in order to mitigate endogeneity concerns. Greater exposure to Chinese imports lowers the share of low-skilled workers within firms, but our within job spell approach has the advantage that changes in the composition of workers is controlled for. We find that the rise in Chinese imports increases the wage gap between low and high skilled workers. A low skilled worker loses 0.48% of his wage for each percentage point increase in Chinese imports. We also document heterogeneous effects within skill groups. Conditional on the workers' skill level we find that those employed in occupations performing tasks with a high routine content experience greater wage losses. By contrast, workers in occupations characterized by non-routine tasks experience higher wages as the level of Chinese import competition rises.

Our results when using firm-level Chinese import competition measures contrast those of studies using industry-level measures. When measured at the industry level, we find that Chinese import penetration does not have a negative effect on wages. This mirrors to some extent the findings in the earlier literature on trade and wages, see, e.g., Feenstra and Hanson (1999). These lack of results also mirror those of two contemporary papers: Autor, Dorn and Hanson (2013) and Ebenstein, Harrison, McMillan and Phillips (2012).

Autor, Dorn and Hanson (2013) use local labor markets instead of industries to analyze the effects of imports. They find that increased exposure to import competition from China depresses manufacturing employment, but no wage effects are found in the manufacturing sector. Instead wages fall in the service sector. They attribute the absent manufacturing wage effects to rigid wage setting or compositional changes. Ebenstein, Harrison, McMillan and Phillips (2012) examine the impact of offshoring and import penetration on wages both within the manufacturing sector and across sectors and occupations. They use data on worker-level wages and occupations and find that workers in occupations most exposed to import penetration experience slower wage growth. However, Ebenstein, Harrison, McMillan and Phillips (2012) also find negligible within industry effects. One of their main contributions is to show that workers that leave manufacturing are the ones who experience wage reductions.

Unlike Autor, Dorn and Hanson (2013) and Ebenstein, Harrison, McMillan and Phillips (2012), this study finds significant wage effects within the manufacturing sector. We do this by exploiting firm-level import penetration measures for a panel of manufacturing firms, while controlling for more aggregate wage effects at the level of industries and local labor markets. Our firm-level measure is more representative of the import competition that firms face and is not attenuated by aggregation, as is the industry level measure.

Our study examines the wage effects of Chinese import penetration both within job-spells, i.e., for the workers who remain employed within the same firm, and over an eight-year period taking into account effects on transitions between jobs and out of employment. Increased import competition may also lead to earnings losses associated with unemployment and earnings changes related to change of firm, industry or occupation. Autor, Dorn, Hanson and Song (2013) find that workers initially employed in U.S. manufacturing industries experiencing high subsequent levels of import growth show lower employment rates and cumulative earnings over ensuing years, and are more likely to swich industries. They do not find differences in these patterns across skill groups. In contrast, we do find a clear skill-wage correlation in the impact of import competition for both workers who remain employed in the firm and over the longer term taking labor market transitions into account.

While Autor, Dorn and Hanson (2013), Autor, Dorn, Hanson and Song (2013) and Ebenstein, Harrison, McMillan and Phillips (2012) focus on more aggregate labor market outcomes, several recent papers analyze how *firms* adjust in response to increased import competition. Bernard, Jensen and Schott (2006) show that American plant survival and growth are negatively correlated with industry exposure to imports from low wage countries.[1] Iacovone, Rauch and Winters (2013) find that Chinese import penetration reduces sales of smaller Mexican plants and more marginal products and they are more likely to cease.[2] Bloom, Draca, and van Reenen (2012) use the number of computers, the number of patents, or the expenditure on R&D as measures of innovation and find that Chinese import penetration correlates positively with within-plant innovation in the UK.[3] Finally, using Belgian firm-level data, Mion and Zhu (2013) find that industry-level im-

[1] Greenaway, Gullstrand, and Kneller (2008) show similar patterns in Swedish firms.

[2] Consistent with this, Liu (2010) finds that import competition leads multi-product US firms to drop peripheral products to refocus on core production.

[3] In a related study Teshima (2010) finds that Mexican plants increase R&D expenditure in response to tariff reductions.

port competition from China reduces firm employment growth and induce skill upgrading in low-tech manufacturing industries. For a survey of recent firm-level empirical research on trade, see Harrison, McLaren and McMillan (2011). In summary, there has been a revival in studies looking at firm-level outcomes, but none of these papers focus on wages as the outcome. In this paper we attempt to fill this gap.

The rest of the paper is structured as follows. Section 2 describes the data on firms and workers and constructs a measure for firm-level Chinese import penetration. Section 3 shows how Chinese import penetration affects components of firm-level domestic sales. Section 4 first motivates and outlines our worker level wage regression framework and then presents the estimation results. Section 5 concludes.

2 Data Description

In this section we describe the Danish labor market, our data sources and show that the rise of China in the global economy has reached Denmark. We then define our measure of Chinese import competition that Danish firms face at home. Finally our instrument for Chinese import penetration is described.

2.1 The Danish Labor Market

The Danish labor market is strongly unionized even by European standards. More than three quarters of all workers are union members and bargaining agreements are extended to cover most of the labor market. However, even if most workers are covered by bargaining agreements, firm-specific demand shocks may easily influence wages. This is because wage contracts typically are negotiated and finalized at the firm level where local conditions may play a role.

There are three different levels at which wages can be negotiated: the Standard-Rate System, the Minimum-Wage and Minimum Pay System; and Firm-level Bargaining. Under the Standard-Rate System the wages of workers are set exclusively by the industry collective agreement. The Minimum-Wage System and the Minimum-Pay System are two-tiered systems in which wage rates negotiated at the industry level represent a floor which can be supplemented by local firm-level negotiations. Under Firm-Level Bargaining wages are negotiated at the firm level without any centrally bargained wage rates. Since 1991 less than 20% of the private labor market is covered by the Standard-Rate System and an increasing share of wage contracts are negotiated exclusively at the worker-firm level. Even under the two two-tiered wage-setting systems the centrally negotiated wage floor typically constitutes only a small part of the final total wage, and so firm specific demand conditions such as increased import competition may play an important role. As a consequence, wages are more in accordance with individual workers' marginal productivity. Dahl, le Maire and Munch (2013) show that decentralization to local firm-level bargaining has increased wage dispersion in the Danish labor market.

Another feature of the Danish labor market is its high degree of flexibility. Employment protection is relatively weak (see Botero, Djankov, La Porta, Lopez-De-Silanes and Shleifer 2004) and as a result turnover rates are high. Workers are compensated for weak employment protection by relatively generous UI benefits when unemployed. However, incentives to search for jobs during unemployment are reinforced by mandatory participation in active labor market programs.

2.2 Register Data

The microdata in our sample period from 1997 to 2008 are drawn from several registers in Statistics Denmark. We describe each in turn. The "Firm Statistics Register" (FirmStat) covers the universe of Danish firms and provides us with annual data on firms' activities and characteristics, such as industry affiliation in accordance with the six-digit NACE classification, total wage bill, employment, output, value added and capital stock. There is also information about the firm's municipality code such that we can classify all firms into local labor markets based on commuting patterns. There are 36 so-called commuting zones defined such that internal commuting is significantly higher than external commuting. All firms in FirmStat are associated with a unique firm id.

Data on the imports and exports of every Danish firm are taken from the "Danish Foreign Trade Statistics"-database. These are compiled in two systems: Extrastat and Intrastat. Extrastat covers all trade with countries outside the European Union and is recorded by customs authorities while Intrastat covers trade with EU countries. Firms are only required to report intra-EU imports and exports if these exceed time-varying thresholds. When comparing to official aggregate statistics, the coverage rate of Extrastat is nearly complete, whereas the coverage rate of Intrastat is around 90%. For every firm, trade flows are recorded according to the eight-digit Combined Nomenclature classification, which amasses to roughly 9,000 products a year. In our main specifications we aggregate these to about 5,000 six-digit HS products, so that we are able to match with the COMTRADE world export supply data, which we use to create our instruments. As the firm identifier is identical to that used in FirmStat, we can match the trade data with our firm data.

From the PRODCOM-database we observe total sales (domestic sales and exports) for each manufacturing firm by ten-digit product codes, which we aggregate to the six-digit Harmonized System (HS) to match the aggregation levels of our trade data and instruments.[4] Subtracting exports from total sales then gives us each firm's domestic sales by products measured in Danish Kroner (DKK). Firms whose employment level or sales are below time-varying thresholds are not required to report sales, and so the coverage rate of the value of sales data is less than complete (around 90%) when comparing with official aggregate statistics. Since the firm id in PRODCOM is the same as the FirmStat identifier, we can match the domestic sales data to the firm statistics.

The worker data comes from the "Integrated Database for Labor Market Research" (IDA). This database covers the entire Danish population aged 15–74. To match every worker in IDA to every firm in FirmStat we use the "Firm-Integrated Database for Labor Market Research" (FIDA). From IDA we obtain worker's hourly wage rate, which is calculated as total labor income plus mandatory pension payments divided by the number

[4]The PRODCOM database has also been used by Bernard, Blanchard, Van Beveren and Vandenbussche (2012) to study so-called carry along trade (goods exported but not produced) by Belgian firms.

of hours worked in the worker's job. Educational attainment is recorded according to the International Standard Classification of Education (ISCED), from which we define high-skilled workers as having a tertiary education corresponding to ISCED categories 5 and 6.[5] All other workers are classified as low-skilled. In addition there is information about the workers' four-digit occupation (recorded according to the International Standard Classification of Occupations, ISCO-88), labor market experience, union membership and marital status.

2.3 The Rise of China

China's emergence as a global economic heavyweight over the course of the last three decades has been intertwined closely with its rise on the scene of international trade, manifested by its accession to the WTO in 2001. While accounting for a negligible 1% of world exports in 1980, by late 2009 that share had increased to 10%, and on the road there, China has overtaken Germany as the world's largest exporter. This increase in world exports has been paralleled by in an increasing presence on the Danish market. From 1990 to 2009, China's share of Danish manufacturing imports grew from 1% to 6.8%. Other low wage economies, notably the Central and Eastern European Countries (CEEC), have also increased their share in Danish imports. The CEEC countries increased their import share from 1.6% in 1990 to 6.5% in 2009, which in part may be attributed to the accession of several of these countries into the European Union in 2004 and 2007. Since the growth in Chinese exports is more dramatic we focus on China, but we also show results for imports from CEEC countries. For comparison, Autor, Dorn and Hanson (2013) report that the low-income-country share of U.S. was 28% in 2007, while the Chinese import penetration ratio measured as Chinese imports as a share of U.S. consumption was 4.6% reflecting that the U.S. is not a small open economy like Denmark. For comparison, we define in the next section the Chinese import penetration ratio as the imports of goods from China divided by the total consumption of goods in the Danish economy (imports+production-exports).

[5] A limited number of workers switch educational group during job spells. To get a clean identification we fix the educational attainment of these workers to the value in the first year of the job spell.

In our data, this ratio has increased from 1.8% in 2001 to 5% in 2008.

Table 1 contains top ten lists of CN8 products imported from China in 1993 and 2009, while Table 2 shows how Chinese imports have hit manufacturing industries very differently. Manufacture of textiles (NACE industry 17–19), Iron and Metal (28) and Transportation and Furniture (35-36) stand out as industries with the highest growth in Chinese imports. This expansion creates a natural experiment which we, via firms, can map onto individual workers in the Danish manufacturing sector. This is done by our Chinese import penetration measure, which we discuss in the next section.

Insert Table 1 here

Insert Table 2 here

2.4 Chinese Import Penetration

We want to measure the level of competition that each individual manufacturing firm faces from China. To do so, we characterize all imports by manufacturing firms as intermediate inputs in line with the "broad offshoring" measure of Hummels, Jørgensen, Munch and Xiang (2013). Imports of intermediate inputs constitute roughly a quarter of all manufacturing imports from all origin countries. The remaining three quarters are final goods imported by non-manufacturing firms. Figure 1 shows that China's share of both intermediate and final goods imports have increased over time, most rapidly from 2002 onwards.

Insert Figure 1 here

In the literature it is common to use industry measures of import competition, see e.g. Bernard et al. (2006), implying that all firms within an industry face the same exposure to imports from China. For comparison, we construct import penetration CIP_{lt}

for four-digit NACE industry l for year t:

$$CIP_{lt} = \frac{M_{lt}^{CH}}{M_{lt} + D_{lt}}, \tag{1}$$

where M_{lt}^{CH} and M_{lt} are the values of final good imports from China and all countries in industry l at time t respectively, and D_{lt} is total domestic sales by Danish firms in industry l.

While CIP_{lt} can describe the variation across industries, our data allows us to measure Chinese import penetration at a finer aggregation, since a feature of the data is a substantial product-level within industry dispersion of Chinese import competition. Figure 2 displays a histogram with HS2 industry-demeaned Chinese import penetrations for products defined at the HS6 level. It is evident that most products deviate considerably from their HS2 industry averages.

Insert Figure 2 here

If firms within the same industry produce and sell different products domestically then they will likely be exposed to differing degrees of Chinese import penetration. To confirm this in the data, we construct a firm-level Chinese import penetration measure CIP_{jt} for firm j in year t:

$$CIP_{jt} = \sum_{k \in \Omega_j} s_{jk} \frac{\left(M_{kt}^{CH} - M_{jkt}^{CH}\right)}{(M_{kt} - M_{jkt}) + D_{kt}}, \tag{2}$$

where M_{kt}^{CH} and M_{kt} are the values of imports from China and all countries for HS6 product k at time t respectively. From these we subtract firm j's own imports, M_{jkt}^{CH} and M_{jkt} since these trade flows will not increase competition for firm j.[6] D_{kt} is total domestic sales of product k by Danish firms at time t. That is, the import penetration for firm j is defined as the weighted average of the Chinese import penetration in the set of firm j's products, Ω_j. The weights, s_{jk}, are defined as the shares of product k in

[6]To investigate the importance of including versus excluding firm j's purchases of product k we also define an alternative version of the import penetration measure where firm j's purchases are included. The correlation between the two measures is .996, so they are very similar.

firm j's total domestic sales over the presample period 1999–2000.[7] This definition keeps constant the product mix in the presample period to measure the extent to which firms subsequently are hit by surges in imports from China.[8] Firms may adjust the product mix to increased import competition, but such (endogenous) responses are outcomes we will later investigate.

Notice that imports by competing domestic manufacturing firms are included in the definition of CIP_{jt} as these will tend to improve the performance of firm j's competitors e.g. through access to cheaper inputs. We also report results for a version of the import penetration measure where we include only final goods as a robustness check. That is, imported intermediate inputs by all manufacturing firms are excluded from the definition of the measure.

Table 3 summarizes the changes in CIP_{jt} across industries in our sample. Several points are worth noting. First, as was the case with the industry-level Chinese import penetration measure in Table 2, our firm-level measure varies greatly across industries with the same industries standing out. Second, and most importantly, Chinese import penetration exhibits substantial variation across firms within industries. For example, in most industries the firm at the 25th percentile is unaffected by Chinese imports while the 75th percentile firm in many cases has a CIP_{jt} at least double that of the median firm.

Insert Table 3 here

After merging our worker-firm data with the constructed CIP_{jt} variable we select all full time manufacturing workers aged 20–60 years in the period 2001–2008. As explained above, the wage rate is calculated as labor income divided by hours worked, so to ensure that our results are not influenced by noisy observations, we trim the data by dropping wage rate observations that are deemed to have a low quality by Statistics Denmark

[7] In defining the presample period there is a trade-off between the length of the sample window (2001–2008) and the range of products sold by domestic firms before the surge in Chinese imports.

[8] This way of defining the import penetration measure is consistent with Autor, Dorn and Hanson (2013). At the level of local labor markets they use initial period employment weights for industries.

(77,159 obs.). In addition, observations in the upper and lower 0.5 percentiles of the wage distribution are deleted (21,924 obs.). Also, to avoid that extreme values of the firm-level import penetration measure influence the results we drop the top percentile of these values (19,718 obs.). Finally, we drop the job-spells that only exist in one year (176,649) since these will be absorbed by job spell fixed effects. With these restrictions our final sample contains about 1.7 million worker–year observations and accounts for 85% of aggregate manufacturing employment among 20-60 year olds. Summary statistics of the data are displayed in Table 4.

Insert Table 4 here

2.5 Instrumental variable

A potential concern in our empirical specification is that unobserved factors such as technology shocks are correlated with both changes in product-level Chinese imports and labor demand. To address this problem, we use Chinese world export supplies as an instrument that is correlated with Danish imports from China but uncorrelated with the firm's wage setting.[9] The instrument I_{jt} for firm j in time t is

$$I_{jt} = \sum_{k \in \Omega_j} s_{jk} WES_{kt},$$

where WES_{kt} is China's total supply of product k to the entire world, minus exports to Denmark, in period t. The world export supplies are based on COMTRADE data at the HS6 product level. WES_{kt} is weighted by presample shares s_{jk} of product k in firm j's total domestic sales. WES_{kt} measures changes in China's comparative advantage that are exogenous to Danish firms and workers. The causal relationship between WES_{kt} and CIP_{jt} arises from the correlation between Denmark's imports for product k and China's comparative advantage in that product. This approach requires that the main driver behind Chinese world export supplies is not import demand by the rest of the world

[9] Autor, Dorn and Hanson (2013) and Hummels, Munch, Jørgensen and Xiang (2013) use similar identification strategies.

but rather changes in Chinese comparative advantage arising due to e.g. an increase in China's productivity in producing k or a decrease in transportation costs/tariffs. A salient example of the latter is the expiration of textile tariffs in 2001 and 2005 that led to huge increases in textiles imports seen in Table 2. We will later explore possible threats to identification using this instrument in the robustness section.

3 Theory

This section outlines the main components of a simple partial equilibrium trade model showing how increases in Chinese import penetration affect firms' product demand and worker specific wages.[10] We use the model as a motivation for our subsequent empirical approach and as a theoretical derivation of our empirical regression specification.

Three main features of the model are required to fit our matched worker-firm data. First, since we observe product specific domestic sales by domestic firms, we rely on recents models of heterogenous firms producing multiple products such as Bernard, Redding and Schott (2011). Since we do not examine product or firm entry/exit we can simplify the heterogeneity and focus on the price and wage effects. We assume that each firm produces two products indexed by $k \in \{l, h\}$, and that within each product category firms supply unique product varieties that are imperfect substitutes for each other. Products l and h are produced by labor specific to that product; low skilled workers are used to produce product l while high skilled workers are used to produce product h. The demand for each variety follows from standard CES preferences with elasticity of substitution, σ_k, between varieties:

$$q_j^k = \alpha_k \frac{\left(p_j^k\right)^{-\sigma_k}}{\Phi_k + \Phi_k'}, \tag{3}$$

where $\Phi_k + \Phi_k'$ quantifies the "toughness" of market competition present in standard CES demand functions. We decompose this "toughness" of competition into that arising from

[10] The details of the model are relegated to the theory appendix.

domestic and from foreign varieties, Φ_k and Φ'_k respectively. We can think of Φ'_k as the effect on demand due to comparative advantages and trade costs for product substitutes emerging from China. That is, an increase in Chinese import penetration reduces the demand for varieties sold by domestic firms. α_k is the Cobb-Douglas proportion of income spent on all varieties of product k.

Second, to capture differential impacts of Chinese import competition across firms and workers we assume that each firm, j, is born with a firm-product specific productivity, φ_j^k (which follows Bernard, Redding and Schott 2011). Since each product k is produced with a specific type of labor, high or low skilled workers, this assumption leads to differences across firms in their product (and worker) mix and thus to differences in their exposure to Chinese import penetration.

Third, for wages to differ across firms we need imperfections in the labor market. If labor markets are fully competitive, employers who cut wages slightly will see all their workers quit immediately. By contrast, if there are frictions in the labor market, firms will face an upward sloping labor supply curve, and wages are possibly specific to the firm.

Frictions in the labor market may arise for a variety of reasons. Search models rely on the assumption that it takes time and effort for workers to change jobs because information about the labor market is imperfect. However, even with full information and no mobility costs firms may have monopsony power if jobs are differentiated due to e.g. commuting distances or non-monetary aspects. Rents in the employment relationship may also arise due to institutions in the labor market such as unions, specific wage setting mechanisms such as efficiency wages or the accumulation of specific human capital.[11] We remain ambivalent as to the exact cause behind imperfections in the labor market, and simply assume that firms face an upward sloping labor supply curve with elasticity λ_k by pointing to the ample evidence for the existence of rents in the employment relationship (reviewed

[11] An emerging literature on trade and labor markets has modeled imperfections such as rent sharing (Amiti and Davis 2012), efficiency wages (Davis and Harrigan 2011), fair wages (Egger and Kreickemeier 2009) and search costs (Davidson, Matusz and Shevchenko 2008 and Helpman, Istkhoki and Redding 2010).

in e.g. Manning 2011).

With these assumptions, we show in the theory appendix that profit maximization leads to the following sales equation for firm j and product k

$$\log p_k^j q_k^j = \left(\frac{\sigma_k - 1}{\sigma_k}\right)\kappa_k + \frac{(\sigma_k - 1)(\lambda_k + 1)}{\sigma_k\lambda_k + 1}\log\varphi_j^k - \frac{\lambda_k + 1}{\sigma_k\lambda_k + 1}\log\left(\frac{\Phi_k + \Phi_k'}{\alpha_k}\right), \tag{4}$$

where κ_k is a constant. Clearly, growth in Chinese import penetration, as modeled by an increase in Φ_k', reduces domestic sales. Similarly, we can derive the wages for high and low skilled workers in firm j;

$$\log w_k^j = \lambda_k\kappa_k + \left(\frac{\lambda_k(\sigma_k - 1)}{\sigma_k\lambda_k + 1}\right)\log\varphi_j^k - \frac{\lambda_k}{\sigma_k\lambda_k + 1}\log\left(\frac{\Phi_k + \Phi_k'}{\alpha_k}\right). \tag{5}$$

Assuming the firm's labor demand curve is upward sloping ($\lambda_k > 0$), an increase in Chinese import competition in a product reduces the wages of the workers used to produce that product. Since Chinese imports are primarily products produced with low-skilled labor, the theory predicts that low skilled workers' wages will fall in those firms facing higher Chinese import penetration.

4 Import Penetration and Firm Outcomes

Before we proceed to the main outcome of interest, worker-level wages, we show how our import penetration measures correlate with firm outcomes. The first column of Table 5 show results from regressions of a firm-level outcome (value added, domestic sales, employment, wage bill etc.) on the industry-level Chinese import penetration measure, where year dummies and firm fixed effects are included as controls. None of the correlations are significantly different from zero. The second column uses our firm-level import penetration measure. Here we find that firms, that are more exposed to import competition see value added and employment drop. Also, sales decrease, which is consistent with equation (4) above. Interestingly, the fall in employment is more pronounced for low-skilled workers than for workers in general. This reduction in the share of low-skilled workers highlights the need to control for within-firm compositional changes when analyzing wages. It is also worth noting that increased Chinese import exposure in the domestic market leads to lower export sales and a lower export intensity. This suggests that firms are simultaneously hit by Chinese import competition in the Danish market and in export markets.

Insert Table 5 here

Given that the firm-specific import penetration measure is strongly correlated with firm outcomes and the industry specific measure is not, we will proceed using the firm-specific version in what follows, while we report some results for the industry-specific measure in the appendix.

4.1 Decomposition of Domestic Sales Changes

The main channel through which Chinese import penetration affects domestic firms is by reducing their demand in the local market. Consistent with the theory in Section 3, Table 5 shows declining domestic sales for firms facing increased Chinese import penetration, and lower demand for a firm's products leads to lower labor demand, which is also evident from Table 5. The aim of this section is to establish a more detailed picture of how firms adjust their domestic sales along different margins and to identify how Chinese import penetration affects this adjustment process. Firm-level domestic sales may change due to increases or decreases in sales of products sold throughout the period, and due to entry and exit of products in the firm's product mix. Decomposing firm-level domestic sales changes this way allows us to subsequently relate these firm components to changes in firm-level Chinese import penetration. Importantly, we will also be able to investigate if firms change their domestic sales of certain product types as measured by the product-level skill intensity. This allows us to derive predictions about how wages of different worker types may be affected.

Our decomposition of firm-level domestic sales follows the approach taken in Bernard, Jensen, Redding and Schott (2009), who decompose U.S. imports and exports into the increase due to the entry of new trading firms, the decrease due to the exit of existing trading firms, and the change due increases or decreases in trade at continuing firms. Instead we consider continuing firms only and calculate for each firm the following components of the overall percentage change in domestic sales, D_{jt}, for firm j between time $t-1$ and t:

$$\frac{\Delta D_{jt}}{D_{jt-1}} = \frac{1}{D_{jt-1}} \sum_{k \in \Omega_j^C} \Delta D_{kjt} + \frac{1}{D_{jt-1}} \sum_{k \in \Omega_j^N} D_{kjt} - \frac{1}{D_{jt-1}} \sum_{k \in \Omega_j^X} D_{kjt-1}.$$

The first term on the right hand side capture sales changes for products that are sold by the firm in both year t and year $t-1$ (denoted C for continuing). The second term is the contribution of new products sold in the last year (denoted N for new products), and the last term measures the contribution of products sold only in the first year (denoted X for exit).

The first column of Table 6 performs the decomposition for the period 2001-2008. The average firm experienced an 18% increase in domestic sales over this period, where 13% was due to the intensive margin increase in sales of continuing products, 20% was attributed to entry of new products, while sales dropped 15% due to exit of products.

Insert Table 6 here

To investigate the direction of skill bias in Chinese import penetration shocks to domestic demand we split each component into high- and low skill intensive products.[12] The first column of Table 6 shows that roughly two-thirds of the intensive margin change is due to rising sales of high-skill intensive products while the rest is due to rising sales of low-skill intensive products. Likewise, the entry component is split into entry of high skill intensive products, low skill intensive products and a residual category that captures

[12] We calculate each product's intensity in the use of high skilled labor as a weighted average of each firm's skill intensity in the presample years, 1999-2000. That is, the skill intensity of product k is defined as $s_k = \sum_j s_j \frac{V_{jk}}{V_k}$, where s_j is firm j's share of high skilled workers in total employment and $\frac{V_{jk}}{V_k}$ is firm j's share of total foreign and domestic sales in product k. We then classify all products with a skill intensity higher than the median product as high skill intensive products.

products that were not produced by any Danish firms in the presample period. Most of the entry component consists of completely new products, while high- and low skill intensive products accounted for 4 and 5% respectively. Finally, most of the exit component is due to firms dropping high-skill intensive products.

How do these components of the growth in firm-level domestic sales relate to Chinese import penetration? The second column of Table 6 shows simple firm-level regressions of each of the calculated components on the change in firm level Chinese import penetration over the period 2001-2008. Consistent with Table 5 there is a clear negative correlation between Chinese import penetration and the total change in firm-level domestic sales. Each of the three main components contribute to lower sales, so firms that are more exposed to imports reduce sales of continuing products, enter fewer new products and exit more initially sold products. Bloom, Draca and Van Reenen (2012) find that innovation as measured by patenting and R&D rises within European firms (including Danish firms) who were more exposed to increases in Chinese imports. This appears not to transmit into greater entry into new products.

The division of products into high- and low skill intensity reveals a stronger correlation between Chinese imports and the low skill intensive products of all three components. That is, Chinese import penetration has a stronger negative correlation with the domestic sale of continuing low-skill intensive products, on entry into new low-skill intensive products and a stronger positive effect on exit out of low-skill intensive products. These patterns suggest that we should expect to see lower demand for workers and in particular for low-skilled workers.

5 Import Penetration and Worker Outcomes

Having established how firms adjust their domestic sales in response to increased Chinese import penetration this section moves on to study the main outcome of interest, worker-level wages. We first specify the empirical model motivated by the theory in section 3. Next we present the estimation results, and finally we perform several robustness exercises.

5.1 Empirical Specification

As argued in section 3, if there are frictions in the labor market, firms will face an upward sloping labor supply curve, and wages are possibly specific to the firm. This, in turn, will leave room for demand shocks due to e.g. changes in import competition to affect wages at the level of the firm. To examine the effect of Chinese import penetration, CIP_{jt}, on wages, we take equation (5) to the data by extending it with controls for observable and unobservable worker and firm characteristics and by allowing for CIP_{jt} to have a differential impact on wages for high- and low-skilled worker through an interaction term with a high-skill indicator variable, H_i. That is, we adopt a standard worker-level Mincer wage equation framework of the form

$$\log w_{ijt} = \gamma_L CIP_{jt} + \gamma_H CIP_{jt} \cdot H_i + x_{it}\beta_1 + z_{jt}\beta_2 + \alpha_{ij} + \varphi_{IND,t} + \varphi_{REG,t} + \varepsilon_{ijt}, \quad (6)$$

where w_{ijt} is the wage rate of worker i employed by firm j at time t. The high skill indicator, H_i, takes the value 1 for workers with a college degree and 0 otherwise. We are ultimately interested in the effect of firm-level Chinese import penetration, CIP_{jt}, on worker wages as indicated by the sign and magnitude of γ_L and γ_H, where γ_H measures the increase in the wage gap between high and low skilled workers in response to a percentage point increase in Chinese import penetration.

x_{it} are observed time varying worker characteristics (experience, experience squared and indicators for marriage and union membership) and z_{jt} are observed time varying firm controls. In accordance with equation (5) we should control for firm productivity, which we capture by including log output, log size, log capital-labor ratio and share of high skilled workers. We also include import and export intensities measured as imports and exports divided by sales.

The term α_{ij} is a worker-firm match fixed effect that controls for time invariant unobserved characteristics specific to the worker-firm job spell. In the literature on wages using matched worker-firm datasets pioneered by Abowd, Kramarz and Margolis (1999) it is common to estimate worker and firm fixed effects separately. Such a specification relies on the assumption of conditional exogenous worker mobility, implying that, conditional on time-varying worker and firm characteristics and worker and firm fixed effects, workers are assigned randomly to firms. In our context it is likely that increased import penetration affects the mobility of workers through unobserved worker-firm match quality, thus violating the assumption of exogenous worker mobility.[13] We therefore include worker-firm match fixed effects to control for endogenous worker mobility.

We also include industry by time dummies, $\varphi_{IND,t}$, and region by time dummies, $\varphi_{REG,t}$, to capture general macroeconomic trends in wages as well as time varying shocks to industries or local labor markets that affect wages. This captures that firms in industries exposed to imports may grow slower than firms in other industries as found by e.g. Bernard, Jensen, and Schott (2006) and changes in wages working at the level of local labor markets as documented by Autor, Dorn and Hanson (2013).

5.2 Estimation Results

To begin, we examine how Chinese import penetration affects workers' wages without correcting for endogeneity. Results from the estimations of equation (6) using the firm-specific measure of Chinese import penetration in equation (2) are presented in Table 7. In columns (1) and (2) we estimate the model controlling only for individual worker characteristics and entering CIP_{jt} alone and interacted with the high-skill dummy respectively. Column (1) shows that a percentage point increase in Chinese import penetration for a firm reduces hourly wages at that firm by 0.137%. This reduction is concentrated in the wages for low-skilled workers, who experience a drop of 0.181% per percentage point increase in CIP_{jt}. On the other hand, high-skilled workers benefit from Chinese import penetration. The wage gap between high and low skilled workers increases by 0.288% for each percentage point increase in CIP_{jt}, resulting in a net gain of 0.107% for high skilled workers. In columns (3)-(6) we succesively add firm more controls, which reduces the

[13] Krishna, Poole and Senses (2011) study the impact of trade liberalization in Brazil using matched worker-firm data. They reject the assumption of exogenous worker mobility by applying the test developed by Abowd, McKinney and Schmutte (2010). Once they control for worker-firm match fixed effects, they find no effect of trade reform on wages.

magnitude of the coefficients slightly, while the net gain for high-skilled workers remain largely unchanged.

Insert Table 7 here

Previous studies (e.g. Bernard, Jensen and Schott 2006) use industry level import penetration measures, but effects working at this level are absorbed by the industry-time fixed effects. To investigate if such effects are important in our data we estimate a version of the model where the industry-time and region-time fixed effects are replaced with time dummies and where we use the industry measure of import competition in equation (1). We find no significant negative relationship between industry measures of Chinese import penetration and wages of low-skilled workers. This is in line with other studies (e.g., Autor, Dorn and Hanson 2013, Ebenstein, Harrison, McMillan and Phillips 2012) that find negligible effects of industry level import penetration measures on workers in that industry. In fact, we find a positive effect of industry-level Chinese import penetration on the wages of high-skilled workers indicating an increased wage gap. In contrast, the negative wage effects of firm-level import penetration found for low-skilled workers in Table 7 are exclusively attributable to over-time changes within the firm, and so this suggests that most of the wage reductions are occurring within firms.

5.3 Instrumental Variable Analysis

In equation (6), the error term, ε_{ijt}, may contain unobserved shocks that affect both Chinese import penetration and the workers' wages. An example would be a positive shock to firm j's productivity that increases its domestic sales, which mechanically lowers CIP_{jt}. The productivity shock simultaneously increases wages for workers at firm j. To identify the causal effect of Chinese import penetration on wages, we instrument CIP_{jt} with Chinese world export supply, denoted by I_{jt}. Insofar as Chinese world export supply proxies for Chinese comparative advantage, it should affect wages only through CIP_{jt}. We address the endogeneity of CIP_{jt} in a two stage estimation procedure. In the first stage, CIP_{jt} and the high-skill interaction term, $CIP_{jt} \cdot H_i$, are regressed on the instrument, I_{jt}, (and $I_{jt} \cdot H_i$) and the other controls. The results of the first-stage regressions are shown in Table 8. In all cases the instruments are strong and have the expected signs.

Insert Table 8 here

Employing predicted values from the first stage, we estimate the models in equation (6) in the second stage. The two first columns of Table 9 display the results controlling only for individual worker characteristics and entering CIP_{jt} alone and interacted with the high-skill dummy respectively. Again we find that the effect of import competition differs across skill types and that low-skilled workers see their wages decline. The IV results have the same signs as in the OLS regression, but the negative wage effect from CIP is more than doubled for low-skilled workers. However, there is now no longer any wage gain for high-skilled workers from increased import penetration. In columns (3)-(6) we succesively add more firm controls, which tends to increase the negative impact on low-skilled workers slightly. In the most comprehensive specification in column (6) wages low-skilled workers fall by 0.478% for each percentage point increase in Chinese import penetration, and the wage skill gap now significantly rises by 0.422% per percentage point.

Insert Table 9 here

These results of course cover the vast variation in import competition changes faced by firms. For example consider two firms over the period 2001 to 2008, one at the median and the other at the 90th percentile of changes in Chinese import competition. The median firm experienced an modest 0.3 percentage point increase in its Chinese import competition, while the 90th percentile firm experienced a much larger increase of 5 percentage points.[14] The estimates of column (6) in Table 9 implies that wages of low-skilled workers staying in the most exposed firm through 2001-2008 fell by 2.4% while low-skilled wages in the median firm decreased 0.2%.

[14] The firm at the 10th percentile experienced a 0.2 percentage point fall in Chinese import competition.

5.4 Occupational Characteristics and Wages

Globalization may have a differential impact on workers not only across but also within skill groups. For example, Lu and Ng (2013) show that import competition induces US industries to employ more non-routine skill sets, and Hummels et al. (2013) find that offshoring shocks to Danish firms leads to lower wages among workers within skill groups performing tasks with high routine contents. We follow the approach in Hummels et al. (2013) and merge occupational characteristics from O*NET via the four-digit occupation codes in our data. We consider routine and non-routine characteristics, choosing O*NET characteristics that are closest to the ones employed by Autor, Levy, and Murname (2003). We compute the principal component, which we then normalize to have mean 0 and standard deviation 1.

Table 10 holds the results. Workers with average routineness scores (i.e., the routineness variables is zero) are now not significantly affected by Chinese import penetration. This is consistent with the previous results as educational attainment is negatively correlated with routineness (the correlation coefficient is -0.54). Workers whose occupations are characterized by higher than average routineness experience greater wage losses. On the other hand, occupations that are characterized by non-routine tasks are affected positively by Chinese import penetration.

Insert Table 10 here

5.5 Robustness

As a robustness check this section compares the effects of import competition from China to imports from other origin countries using the full model specification from column (6) in Table 9. Over the period 2001–2008 imports from the Central and Eastern European Countries (CEEC) have also increased substantially but not quite to the same extent as the more dramatic rise in imports from China. The first column of Table 11 show that the effect of imports from China and CEEC combined is negative for low-skilled workers, but the point estimate is somewhat closer to zero. In column (2) Chinese imports are lumped together with imports from other low-income countries.[15] Here the results for low-skilled workers are similar to those of Table 9 while high-skilled workers appear to be hurt more. This suggests that Chinese import penetration is special amongst low-wage countries in that it affect the wages of high-skilled workers to a lesser extent. In column (3) we estimate the impact of import penetration from high-income countries defined as EU-15 plus USA and Japan. Here there is no significantly negative effect for the low-skilled workers, but the sign is now significantly negative for high-skilled workers such that they see their wages drop relatively more in response to increasing imports from these countries. This is in line with a Stolper-Samuelson interpretation, since the factor content of trade here presumably is more skill-intensive.

Insert Table 11 here

In the next two columns of Table 11 we impose more strict sample selection criteria. We first drop small firms with fewer than 50 employees, and in the next column we exclude job-spells where the firm-level Chinese import penetration variable is zero throughout. The results show that, if anything, the estimates from our main specification in column (6) in Table 9 are conservative.

In column (6) of Table 11 we change the definition of Chinese import penetration such that imported intermediates by manufacturing firms no longer are included. Qualitatively, we find the same effects, but the parameter estimates are now roughly doubled. However, in terms of economic significance there is not much of a change, since the mean value of the alternative import penetration measure (and the avereage change in import penetration) is substantially lower (the mean drops from 0.020 to 0.012).

In the final robustness exercise we investigate threats to identification. Suppose there is a product specific demand shock that affects both Chinese firms and Danish firms selling the same product. This will be correlated with China's world export supply and with

[15] We use the World Bank definition in 1989 to classify countries as being low-income.

sales by Danish firms. This is a demand induced positive correlation between Chinese import penetration and performance of Danish firms, which is unaccounted for by our world export supply instrument, and so this should create a bias toward finding a positive wage coefficient and not a negative coefficient. There are several reasons why we think such concerns are not merited. First we include industry-year fixed effects, firm output and exports, which should control for shocks to industries and firms both domestically and in export markets. Second, following Autor, Dorn and Hanson (2013) we tried to drop industries that were particularly likely to experience correlated demand shocks in the 2000s (computers and industries supplying inputs to construction). The final column of Table 11 shows that there is a very modest change in the estimated wage coefficients (they fall from -0.478 to -0.515 and from 0.422 to 0.392) from dropping these industries.

6 Long Term Impacts of Chinese Import Penetration

The preceding analysis has focused on the impact of import penetration on wages within job-spells. However, our data allows us to track workers over time as they move across job-spells and spells of unemployment. In this section we use this information to study how import penetration has impacted workers over our sample period along dimensions that are not identified when focusing on within job-spell effects. A number of recent papers analyze long term impacts on worker outcomes from various changes to their economic environment[16], and we adapt the approach taken in Autor, Dorn, Hanson and Song (2013) to our data. Unlike Autor, Dorn, Hanson and Song (2013) we can estimate effects for high- and low-skilled workers separately and by occupational characteristics, and we can define the import competition measure at the level of the firm instead of the level of the industry.

We start with a cohort of workers who were full-time employees of manufacturing firms in 2001. These workers are then tracked throughout the sample period from 2001 to 2008,

[16] Walker (2013) estimate the impact of environmental regulations on worker earnings and labor market reallocations, and Hummels et al. (2013) estimate the impact of firm-level offshoring on worker earnings.

as they move between firms, industries, occupations, and spells of unemployment. We then run regressions of the form

$$y_{ij} = \alpha + \gamma_1 \Delta CIP_j + \gamma_2 CIP_{j,01} + x'_{i,01}\beta_1 + z'_{j,01}\beta_2 + \varphi_l + \delta_r + \varepsilon_{ij}, \tag{7}$$

where y_{ij} is some outcome variable for worker i initially employed at firm j, ΔCIP_j is the change in Chinese import penetration from 2001 to 2008 for firm j, $CIP_{j,01}$ is the initial import penetration for firm j (in year 2001), $x_{i,01}$ is a set of initial worker characteristics (experience, experience squared, and marriage and union dummies), $z_{j,01}$ is a set of initial firm characteristics (log initial output, log capital-labor ratio, log size, share of high skill workers, and export and import intensities), φ_l are two-digit NACE industry dummies, and δ_r are region dummies (so-called commuting zones as defined in the data section). Both the worker and the initial firm must be observed throughout the sample period in order for us to be able to estimate the above model.

We run the regression for different dependent variables. In line with the preceding focus on wage outcomes, we start by examining the impact of an increase in Chinese import competition for firm j on the cumulative earnings of workers initially employed by the firm. Cumulative earnings are defined as the sum of annual labor incomes, Y, normalized by the initial income of the worker, $\sum_{t=2001}^{2008} Y_{it}/Y_{i,2001}$. The results are displayed in table 12. Column (1) shows that OLS fails to find any significant impact of Chinese import penetration. In column (2) we instrument for Chinese import penetration using the Chinese world export supply variable described earlier and find a negative and statistically significant effect of changes in import competition on the cumulative earnings of low-skilled workers. That is, low-skilled workers initially employed at firms who subsequently face increasing import competition from China, have lower earnings from 2001 to 2008. This is qualitatively in line with the within-job spell results found in Table 9.

Insert Table 12 here

By contrast, high-skilled workers do not seem to be affected negatively; if anything, their earnings are increased by changes in Chinese import penetration. Column (3) shows that controlling for initial firm import penentration does not significantly alter the estimates. Finally, columns (4) and (5) add interaction terms between the change in Chinese import penetration and workers' occupational characteristics. The earnings of workers performing tasks characterized by routineness are adversely affected by changes in Chinese import competition, while the reverse is true for workers performing non-routine tasks. Again, these results are consistent with the within job-spell wage results found in Table 11.

To quantify the results of Table 12 we can compare a low-skilled worker employed by the median firm of the change in import competition (0.3 percentage points) and a low-skilled worker employed by the 90th percentile firm (5 percentage points). The estimates in column (2) suggest that the worker at the 90th percentile firm has experienced 12.8% lower earnings of initial annual labor earnings over the period from 2001 to 2008 relative to the worker at the median firm $(2.725 \times (5-0.3))$. This difference is substantially greater than that derived from the within job spell results from the previous section (a differential of 2.2% over the period 2001 to 2008 for low skilled workers staying in the firm). This suggests that much of the impact on earnings is due to other sources such as time spent unemployed, job changes to lower paid employment or changes in hours worked.

To better understand why the earnings of low-skilled, but not high-skilled, workers are lowered by increased exposure to import competition, we next focus on three different outcomes. The first three columns of table 13 show the results for regressions where we use cumulative income transfers (the sum of UI benefits and welfare assistance) normalized by initial income as the dependent variable. High-skilled workers initially employed at firms that were subsequently hit by Chinese import penetration have less cumulative transfers over the sample period than do other high-skilled workers. On the other hand, conditioning on education workers performing routine tasks have higher transfers. The remaining six columns of table 13 show results where the dependent variable is the share of the sample period spent in unemployment and employment, respectively. High-skilled workers, and workers doing non-routine tasks, who face increasing import competition in their initial firms are less unemployed, and spend more time in employment[17], while workers doing routine tasks are more unemployed and spend less time in employment. It is also worth noting that increased import competition does not increase the time spent in unemployment for low-skilled workers (column 4). This suggests that the negative earnings effects found in Table 12 mainly must be ascribed altered job change patterns or hours worked.

Insert Table 13 here

In order to understand the employment effect of changes in Chinese import penetration, we decompose the cumulative employment effect from column (7) of table 13 into the share of the period spent in the initial industry and occupation, in the initial industry and a new occupation, in a new industry and the initial occupation, and finally in a new industry and occupation. The results of the regressions using these as outcomes are shown in table 14, where the coefficients in columns (2) to (5) sum to the corresponding coefficient in column (1). High-skilled workers facing increases in import competition are less likely to remain in their initial industry and occupation, as they seek towards, in particular, new occupations. On the other hand, low-skilled workers exposed to higher import competition are more likely to remain in their original industry and occupation.

Insert Table 14 here

To summarize the results of this section, low-skilled workers whose initial firms are hit by increased Chinese import penetration do not experience increased unemployment and tend to remain in their initial industries and occupations. This lack of mobility is translated into lower earnings relative to less exposed low-skilled workers. High-skilled workers are much more mobile, in particular across occupations, giving them an advantage

[17] The magnitudes of the employment effects for high-skilled workers are relatively modest: Column (7) shows that a high-skilled worker at the 90th percentile firm spends 3.6% more of the sample period in employment than a high-skilled worker at the median firm ($0.767 \times (5 - 0.3)$). These results should be considered in light of the fact that the Danish economy achieved close to full employment from 2006 to 2008, resulting in fewer than normal transitions to unemployment.

when their initial firm is hit by Chinese competition.

7 Conclusion

It is often claimed that the economic rise of China has cascading effects on the rest of the world. Rising comparative advantages in particular products has made China the largest exporter in the world. Domestic firms must now compete with Chinese product in their own local markets. This may have pronounced effects on firms' production structure and the wages of its workers. However, previous literature has been unable to find evidence for an increasing skill-wage gap.

In this paper, we have documented this process for Danish firms. Imports from China has increased substantially, rising from around 2% of all imports in 1997 to almost 7% in 2009. These increases are concentrated in a handful of industries, notably textiles and furniture. Within an industry, these increases exposes only a subset of the firms. For example, in most industries the firm at the 25th percentile is unaffected by Chinese imports while the 75th percentile firm in many cases has a Chinese import penetration measure at least double that of the median firm.

Consistent with the predictions from a simple multi-product heterogenous firm model with imperfect labor markets we find that firms exposed to increasing Chinese import penetration experience a reduction in domestic sales. This reduction has a clear skill bias as sales low-skill intensive products drop relatively more. Again relying on the simple theoretical framework this suggests that wages of low-skilled workers in particular should fall. We confirm this prediction in two ways. First, within job-spells we find that low-skilled workers lose around 0.48% of their wages for each percentage point increase in Chinese import penetration, while the wages of high-skilled workers are affected to a lesser extent. Second, we estimate the long-term impacts of Chinese import penetration on earnings over an eight-year period taking into account transitions between jobs and into unemployment. This approach confirms the finding that low-skilled workers see their labor earnings fall in response to increased Chinese import penetration, while high-skilled workers tend to be unaffected. Further, we show that low-skilled workers do not experience increased unemployment and tend to remain in their initial industries and occupations in response to increase import competition.

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A Theory appendix

In order to understand the mechanism by which Chinese import penetration affects firm outcomes, we present a partial equilibirum model with heterogeneous firms, multiple inputs and outputs, and an increasing labor supply curve for workers.

A.1 Demand

Each firm produces two products, indexed by $k \in \{l, h\}$.[18] Within each product category, firms indexed by j supply unique varieties k_j that are imperfect substitutes for each other. The demand x_j^k for variety k_j is dual-staged, mirroring that of Helpman and Krugman (1985):

$$\begin{aligned} q_j^k &= \alpha_k \frac{\left(p_j^k\right)^{-\sigma_k}}{\Phi_k + \Phi_k'} \\ \Phi_k &= \int_{k_j \in J_k} \left(p_j^k\right)^{1-\sigma_k} \\ \Phi_k' &= \int_{k_j \in J_k'} \left(p_j^k\right)^{1-\sigma_k}, \end{aligned} \tag{8}$$

where p_j^k is the price of variety k_j of product k, σ_k is the Dixit-Stiglitz elasticity of substitution between varieties of product k, and α_k is the Cobb-Douglas proportion of income spent on all varieties of k ($\alpha_l + \alpha_h = 1$). Φ_k and Φ_k' are the toughness of competition for product k arising from domestic and foreign varieties, respectively. This distinction between domestic and foreign captures the effect of Chinese import penetration, which will increase Φ_k'. We assume that individual varieties are differential and the characteristics of any single variety does not change the overall Φ_j. As in Autor, Dorn and Hanson (2013), an increase in Φ_k or Φ_k' will result in lower demand for variety k_j. To proceed, we find the

[18] We limit our discussion to two products to facilitate exposition. However, the model can encompass any number of products since there are no supply side interactions among the products.

inverse demand function from equation (**??**):

$$\begin{aligned} p_j^k &= \left(\frac{\Phi_k + \Phi_k'}{\alpha_k}\right)^{-\frac{1}{\sigma_k}} \left(x_j^k\right)^{-\frac{1}{\sigma_k}} \\ \log p_j^k &= -\frac{1}{\sigma_k} \log\left(\frac{\Phi_k + \Phi_k'}{\alpha_k}\right) - \frac{1}{\sigma_k} \log x_j^k \end{aligned} \tag{9}$$

A.2 Production and Labor Demand

Products are supplied by firms indexed by j. Products l and h are produced by labor specific to that product. Specifically low skilled workers are used to produce product l while high skilled workers are used to produce product h.[19] The firm also has a firm-product specific productivity φ_j^k denoting the efficiency of its workers. Firm j can transform one unit of labor of type $k \in \{l, h\}$ into φ_j^k units of product k. Therefore, to produce q_j^k units, firm j demands L_k^j units of labor, where

$$L_k^j = \frac{q_k^j}{\varphi_j^k}. \tag{10}$$

Since we will not model firm entry and exit in this model, we assume firms are fully aware of their productivities φ_j^k for each product k.[20]

A.3 Firm level labor supply

As discussed in the theory section firms face an upward sloping firm-specific labor supply curve due to imperfections in the labor market. For each type of worker $k \in \{l, h\}$, the labor supply curve is described by the function $w\left(L_k^j\right)$, where:

$$w_k^j = w\left(L_k^j\right) = \left(L_k^j\right)^{\lambda_k}. \tag{11}$$

[19] This partitioning of workers allows us to generate explicit predictions concerning the effects of Chinese import penetration. However, we must abstract from product interactions to maintain simplicity. An extension to this model would include a HOV style production function where some high skilled workers are required to manufacture the low-skilled product.

[20] Firm-product specific productivities are introduced in Bernard, Redding and Schott (2011), although they call it firm ability and firm-product attributes.

A.4 Profit Maximization

Given the inverse demand function in equation (9), the firm's unit labor requirement in equation (10), and the firm's labor supply curve in equation (11), the firm must choose the quantities of each product it will supply to the market. The firm's maximization problem can be written as:

$$\begin{aligned}
\max_{q_1,q_2} \pi_j &= \sum_{k=l,h} \left[p_k^j q_k^j - w_k\left(L_k^j\right) L_k^j\right] \\
&= \sum_{k=l,h} \left[\left(\frac{\Phi_k + \Phi_k'}{\alpha_k}\right)^{-\frac{1}{\sigma_k}} \left(q_k^j\right)^{1-\frac{1}{\sigma_k}} - \left(\frac{q_k^j}{\varphi_j^k}\right)^{\lambda_k+1}\right]
\end{aligned}$$

with first order conditions:

$$\frac{d\pi_j}{dq_k} = \left(1 - \frac{1}{\sigma_k}\right)\left(\frac{\Phi_k + \Phi_k'}{\alpha_k}\right)^{-\frac{1}{\sigma_k}} \left(q_k^j\right)^{-\frac{1}{\sigma_k}} - \frac{(\lambda_k+1)}{\varphi_j^k}\left(\frac{q_k^j}{\varphi_j^k}\right)^{\lambda_k}.$$

By setting $\frac{d\pi_j}{dq_k} = 0$, we find the profit maximing outputs for each product $k \in \{l, h\}$:

$$\begin{aligned}
q_k^j &= \left(\frac{\sigma_k - 1}{\sigma_k(\lambda_k+1)}\right)^{\frac{\sigma_k}{\sigma_k\lambda_k+1}} \left(\varphi_j^k\right)^{\frac{\sigma_k(\lambda_k+1)}{\sigma_k\lambda_k+1}} \left(\frac{\Phi_k + \Phi_k'}{\alpha_k}\right)^{-\frac{1}{\sigma_k\lambda_k+1}} \\
\log q_k^j &= \kappa_k + \frac{\sigma_k(\lambda_k+1)}{\sigma_k\lambda_k+1}\log\varphi_j^k - \frac{1}{\sigma_k\lambda_k+1}\log\left(\frac{\Phi_k + \Phi_k'}{\alpha_k}\right),
\end{aligned}$$

where $\kappa_k = \frac{\sigma_k}{\sigma_k\lambda_k+1}\log\left(\frac{\sigma_k-1}{\sigma_k(\lambda_k+1)}\right)$. Revenues can be obtained by adding the log inverse demand from equation (9):

$$\log p_k^j q_k^j = \left(\frac{\sigma_k - 1}{\sigma_k}\right)\kappa_k + \frac{(\sigma_k-1)(\lambda_k+1)}{\sigma_k\lambda_k+1}\log\varphi_j^k - \frac{\lambda_k+1}{\sigma_k\lambda_k+1}\log\left(\frac{\Phi_k + \Phi_k'}{\alpha_k}\right) \tag{12}$$

which shows a negative relationship between the revenues of product k and level of imports Φ_k'.

The wages for workers of type k can also be determined by combining the profit maximizing quantity with the labor supply curve:

$$w_k^j = \left(L_k^j\right)^{\lambda_k} = \left(\frac{q_k^j}{\varphi_j^k}\right)^{\lambda_k}$$

and log linearizing:

$$\log w_k^j = \lambda_k \kappa_k + \left(\frac{\lambda_k\left(\sigma_k - 1\right)}{\sigma_k \lambda_k + 1}\right)\log \varphi_j^k - \frac{\lambda_k}{\sigma_k \lambda_k + 1}\log\left(\frac{\Phi_k + \Phi_k'}{\alpha_k}\right). \tag{13}$$

The revenue equation and the wage equation describe the effects of Chinese import penetration on firm and worker level outcomes.

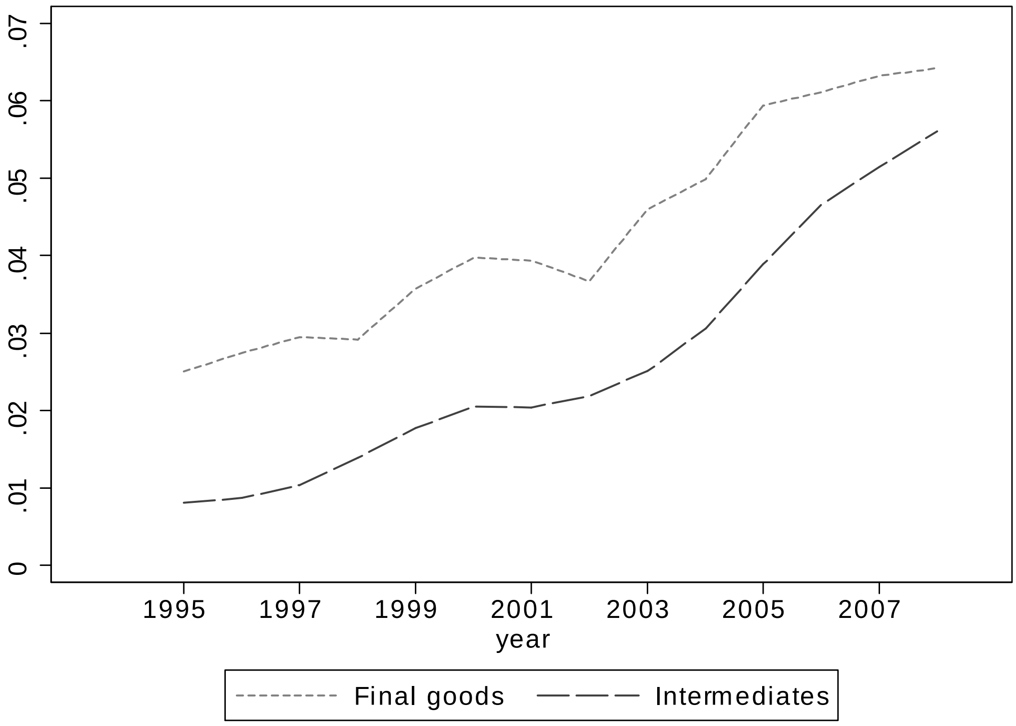

Figure 1: Chinese import shares in Denmark

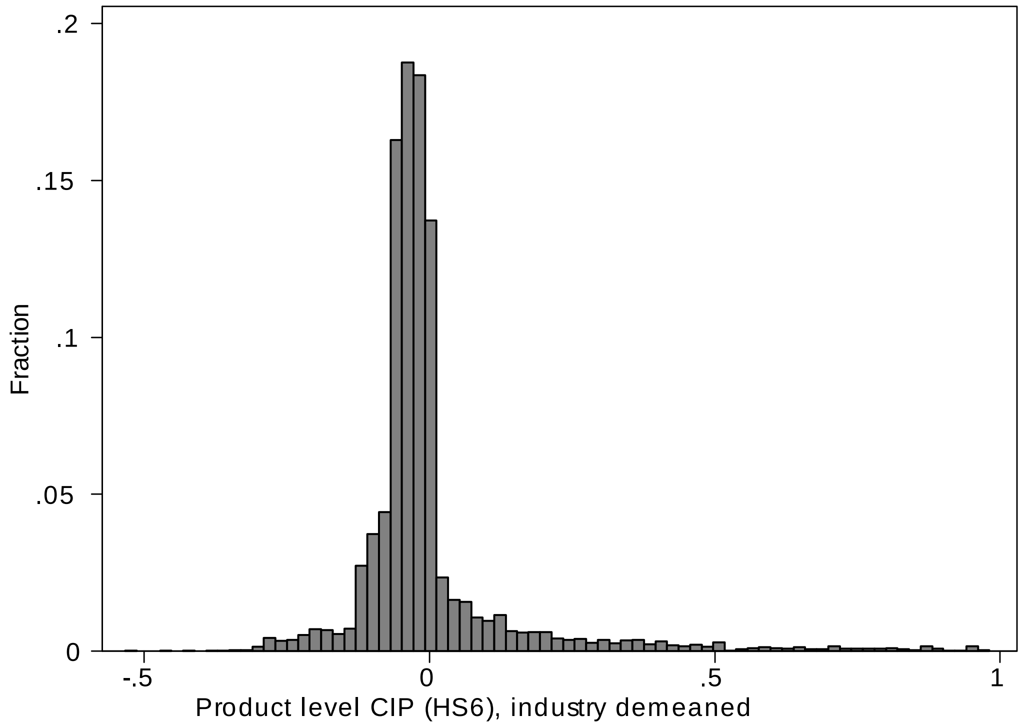

Figure 2: Product level Chinese import penetration.

Table 1 – **Top 10 Imports From China**

Rank	Year	CN8	Product	Value (bio. DKK)	China's share
1	1993	61091000	T-shirts, singlets and other vests, knitted or crocheted	12.6	0.20
2	1993	62112000	Ski suits	10.4	0.79
3	1993	95039031	Tricycles, scooters... [other toys]	8.48	0.42
4	1993	62052000	Men's shirts – of cotton	6.23	0.22
5	1993	62064000	Women's blouses, shirts and shirt-blouses	5.09	0.17
6	1993	39269099	Other articles of plastics	4.66	0.07
7	1993	62034235	Trousers, bib and brace overalls, breeches and shorts	4.61	0.34
8	1993	61101091	Jerseys, pullovers, cardigans, waistcoats and similar articles of cotton	4.54	0.27
9	1993	61046210	Trousers, bib and brace overalls, breeches and shorts	4.37	0.28
10	1993	42029291	Traveling-bags, toilet bags, rucksacks and sports bags	4.31	0.47
1	2009	89012010	Tankers – Seagoing	176	0.47
2	2009	84713000	Portable automatic data-processing machines	58.5	0.15
3	2009	61103099	Jerseys, pullovers, cardigans, waistcoats and similar articles of man made fibers, women's	45.8	0.63
4	2009	62046239	Women's trousers, bib and brace overalls, breeches and shorts of cotton	42.6	0.54
5	2009	62029300	Women's overcoats, car coats, capes, cloaks [and similar] of man made fibers	33.9	0.80
6	2009	61102099	Jerseys, pullovers, cardigans, waistcoats and similar articles of cotton, women's	31.6	0.47
7	2009	61102091	Jerseys, pullovers, cardigans, waistcoats and similar articles of cotton, men's	27.1	0.40
8	2009	62046231	Women's trousers, bib and brace overalls, breeches and shorts of denim	25.5	0.31
9	2009	94016100	Seats of cane, osier, bamboo or similar materials – Upholstered	24.6	0.22
10	2009	73089099	Structures and parts of structures (for example, bridges [...])	24.5	0.10

Table 2 – **Chinese Import Shares by Danish Manufacturing Industries**

Industry	Name	CIS 2001	CIS 2008	Δ CIS	Employment share 2001
15	Food and drinks	0.0080	0.0137	0.0056	0.169
16	Tobacco	0.0000	0.0000	0.0000	0.002
17	Textiles	0.0696	0.2171	0.1475	0.012
18	Clothing	0.2405	0.3375	0.0970	0.000
19	Leather	0.1239	0.2079	0.0841	0.000
20	Wood	0.0181	0.0416	0.0235	0.035
21	Paper	0.0036	0.0155	0.0120	0.016
22	Graphics	0.0164	0.0424	0.0260	0.044
23	Mineral oil	0.0000	0.0001	0.0001	0.002
24	Chemistry	0.0085	0.0162	0.0077	0.128
25	Rubber and plastics	0.0358	0.0558	0.0200	0.059
26	Stone, clay, and glass	0.0391	0.0708	0.0317	0.045
27	Metals	0.0075	0.0150	0.0076	0.018
28	Iron and metal	0.0539	0.1035	0.0497	0.080
29	Machinery	0.0184	0.0535	0.0351	0.192
30	Office and IT	0.0213	0.0468	0.0255	0.002
31	Other elect. machinery	0.0372	0.0837	0.0466	0.045
32	Tele industry	0.0384	0.0806	0.0421	0.012
33	Medical equip., clocks, etc.	0.0371	0.0759	0.0389	0.045
34	Car	0.0013	0.0120	0.0106	0.021
35	Other transportation	0.0740	0.1201	0.0460	0.022
36	Furniture and other manuf.	0.1231	0.2510	0.1280	0.049
37	Recycling	0.0000	0.0000	0.0000	0.001
Total		0.0375	0.0676	0.0302	1.000

Table 3 – **Dispersion in Firm-Level Chinese Import Penetration, 2008**

Industry	Name	Mean	sd	p25	p50	p75
15	Food and drinks	0.002	0.007	0.000	0.000	0.001
16	Tobacco	0.000	0.000	0.000	0.000	0.000
17	Textiles	0.111	0.160	0.001	0.026	0.170
18	Clothing	0.231	0.128	0.132	0.243	0.342
19	Leather	0.095	0.003	0.092	0.097	0.097
20	Wood	0.011	0.037	0.001	0.001	0.004
21	Paper	0.012	0.008	0.007	0.014	0.017
22	Graphics	0.004	0.017	0.000	0.001	0.002
23	Mineral oil	0.000	.	0.000	0.000	0.000
24	Chemistry	0.004	0.014	0.000	0.000	0.004
25	Rubber and plastics	0.028	0.029	0.003	0.029	0.040
26	Stone, clay, and glass	0.016	0.044	0.000	0.000	0.004
27	Metals	0.028	0.032	0.004	0.016	0.042
28	Iron and metal	0.025	0.041	0.007	0.012	0.025
29	Machinery	0.017	0.033	0.001	0.006	0.017
30	Office and IT	0.056	0.057	0.000	0.054	0.082
31	Other elect. machinery	0.043	0.057	0.002	0.013	0.063
32	Tele industry	0.052	0.075	0.000	0.017	0.055
33	Medical equip., clocks, etc.	0.023	0.037	0.003	0.008	0.025
34	Car	0.014	0.035	0.000	0.001	0.014
35	Other transportation	0.020	0.026	0.000	0.009	0.033
36	Furniture and other manuf.	0.075	0.058	0.018	0.070	0.128
37	Recycling	0.000	0.000	0.000	0.000	0.000

Table 4 – **Descriptive Statistics: Worker Sample**

	Mean	Std. Dev	P25	Median	P75
Wage	218.35	78.11	168.26	201.48	247.20
Output (mio. DKK)	3,586	7,329	1,172	4,388	2,306
Size	1632.51	2957.26	92	313	1122
Cap./Labor (1,000 DKK)	432.25	449.36	181.33	305.30	496.01
Shr. High Skill	0.21	0.15	0.10	0.17	0.27
Exports/Sales	0.52	0.34	0.19	0.58	0.84
Imports/Sales	0.18	0.16	0.05	0.14	0.27
Experience	19.07	9.66	11.19	18.98	26.66
Experience^2	456.75	387.04	125.13	360.05	710.86
Married	0.58	0.49	0	1	1
Union Member	0.86	0.35	1	1	1

Note: Number of observations is 1688249.

Table 5 – **Firm-Level Effects of Chinese Import Penetration**

	Industry CIP	Firm CIP
log...		
profits	-0.116	-0.644
value added	0.230	-0.782***
domestic sales	0.479	-0.455**
exports	0.426	-1.905***
export intensity	0.426	-1.199***
imports	0.932	-0.372
employment	0.544*	-0.520***
low skill employment	0.352	-0.939***
wage bill	0.432	-0.590***
capital/labor	-0.463	-0.880**
Year dummies	Yes	Yes
Firm fixed effects	Yes	Yes

Notes: Standard errors adjusted for clustering at the firm level. Both columns are from regressions of each firm outcome variable on a single Chinese Import Penetration variable. *** p< 0.01, ** p< 0.05, * p< 0.10.

Table 6 – Decomposing Firm-Level Sales Changes, 2001-2008

	(1)	(2)
Total	0.1840	-1.990***
		(0.57)
Intensive Margin	0.1336	-1.379***
		(0.34)
Low Skill Intensity	0.0480	-0.975***
		(0.28)
High Skill Intensity	0.0847	-0.403**
		(0.16)
Residual Skill Intensity	0.0008	-0.000
		(0.00)
Entry	0.2019	-2.290***
		(0.47)
Low Skill Intensity	0.0496	-0.966***
		(0.21)
High Skilled Intensity	0.0394	-0.584*
		(0.35)
Residual Skill Intensity	0.1130	-0.741***
		(0.14)
Exit	-0.1515	1.679***
		(0.17)
Low Skill Intensity	-0.0430	1.098***
		(0.15)
High Skill Intensity	-0.1024	0.581***
		(0.09)
Residual Skill Intensity	-0.0060	0.000
		(0.00)

Notes: Column (1) shows averages of the decompositions of firm-level sales changes across firms. The coefficients in column (2) are obtained from firm-level regressions of each component of the domestic sales decompositions on the change in Chinese import penetration. $N = 2,037$. *** p< 0.01, ** p< 0.05, * p< 0.10.

Table 7 – Mincer Wage Regressions, Fixed Effects

	(1)	(2)	(3)	(4)	(5)	(6)
CIP	-0.137***	-0.181***	-0.169***	-0.168***	-0.166***	-0.165***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
CIP * High Skill		0.288***	0.269***	0.270***	0.268***	0.268***
		(0.04)	(0.05)	(0.05)	(0.04)	(0.04)
Experience	0.009***	0.009***	0.008***	0.008***	0.008***	0.008***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Experience^2	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Married	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Union	0.020***	0.020***	0.020***	0.020***	0.020***	0.020***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Log Output			0.031***	0.032***	0.032***	0.032***
			(0.00)	(0.00)	(0.00)	(0.00)
Log Size			0.002	0.001	0.001	0.001
			(0.00)	(0.00)	(0.00)	(0.00)
Log Cap./Lab.			0.002***	0.002***	0.002**	0.002**
			(0.00)	(0.00)	(0.00)	(0.00)
Shr. High Skill			-0.017	-0.018	-0.017	-0.017
			(0.01)	(0.01)	(0.01)	(0.01)
Imports/Sales				0.011**		0.010**
				(0.00)		(0.00)
Exports/Sales					0.013***	0.012***
					(0.00)	(0.00)
R-squared (within)	0.126	0.126	0.129	0.129	0.129	0.129
Observations	1688249	1688249	1688249	1688249	1688249	1688249
Job-Spell FE	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Columns show regressions on log wages. Standard errors, clustered at the firm-year level, in parentheses. *** $p< 0.01$, ** $p< 0.05$, * $p< 0.10$.

Table 8 – First Stage Regressions

	(1a)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)	(6a)	(6b)
CIP WES	0.186***	0.189***	-0.005***	0.190***	-0.005***	0.190***	-0.005***	0.190***	-0.005***	0.190***	-0.005***
	(0.01)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)
CIP WES * High Skill		-0.018***	0.183***	-0.018***	0.183***	-0.018***	0.183***	-0.018***	0.183***	-0.018***	0.183***
		(0.00)	(0.02)	(0.00)	(0.02)	(0.00)	(0.02)	(0.00)	(0.02)	(0.00)	(0.02)
Experience	-0.000	0.000	0.000**	0.000	0.000**	0.000	0.000**	0.000	0.000**	0.000	0.000**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Experience^2	-0.000	-0.000	-0.000***	-0.000	-0.000***	-0.000	-0.000***	-0.000	-0.000***	-0.000	-0.000***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Married	-0.000**	-0.000**	0.000**	-0.000**	0.000**	-0.000**	0.000**	-0.000**	0.000**	-0.000**	0.000**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Union	0.000	-0.000	0.000	-0.000	0.000	-0.000	0.000	-0.000	0.000	-0.000	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Log Output				-0.000	-0.000	-0.001	-0.000	-0.001	-0.000	-0.001	-0.000
				(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Log Size				-0.002**	0.000	-0.002**	0.000	-0.002**	0.000	-0.002*	0.000
				(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Log Cap./Lab.				0.000	0.000*	0.000	0.000*	0.000	0.000*	0.000	0.000*
				(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Shr. High Skill				0.002	-0.000	0.002	-0.000	0.002	-0.000	0.002	-0.000
				(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Imports/Sales						-0.005***	-0.001**			-0.005***	-0.001**
						(0.00)	(0.00)			(0.00)	(0.00)
Exports/Sales								-0.001	0.000	-0.001	0.000
								(0.00)	(0.00)	(0.00)	(0.00)
R-squared (within)	0.416	0.417	0.248	0.418	0.248	0.418	0.248	0.418	0.248	0.418	0.248
Observations	1688249	1688249	1688249	1688249	1688249	1688249	1688249	1688249	1688249	1688249	1688249
F-stat. for instr.	540	274	86	278	87	282	88	277	87	281	88
Job-Spell FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable in columns marked 'a' is CIP, and in columns marked 'b' it is CIP * High Skill. Standard errors, clustered at the firm-year level, in parentheses. *** p< 0.01, ** p< 0.05, * p< 0.10.

Table 9 – **Mincer Wage Regressions, IV**

	(1)	(2)	(3)	(4)	(5)	(6)
CIP	-0.388**	-0.457***	-0.485***	-0.488***	-0.475***	-0.478***
	(0.18)	(0.16)	(0.17)	(0.17)	(0.17)	(0.17)
CIP * High Skill		0.462**	0.422**	0.424**	0.421**	0.422**
		(0.19)	(0.19)	(0.19)	(0.19)	(0.19)
Experience	0.009***	0.008***	0.008***	0.008***	0.008***	0.008***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Experience^2	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Married	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Union	0.020***	0.020***	0.020***	0.020***	0.020***	0.020***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Log Output			0.031***	0.032***	0.032***	0.032***
			(0.00)	(0.00)	(0.00)	(0.00)
Log Size			0.001	0.001	0.000	0.000
			(0.00)	(0.00)	(0.00)	(0.00)
Log Cap./Lab.			0.002***	0.002***	0.002**	0.002**
			(0.00)	(0.00)	(0.00)	(0.00)
Shr. High Skill			-0.018	-0.018	-0.017	-0.018
			(0.01)	(0.01)	(0.01)	(0.01)
Imports/Sales				0.010*		0.009*
				(0.00)		(0.00)
Exports/Sales					0.011**	0.011**
					(0.00)	(0.00)
R-squared (within)	0.126	0.126	0.129	0.129	0.129	0.129
Observations	1688249	1688249	1688249	1688249	1688249	1688249
Job-Spell FE	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Columns show regressions on log wages. Standard errors, clustered at the firm-year level, in parentheses. *** $p< 0.01$, ** $p< 0.05$, * $p< 0.10$.

Table 10 – **Mincer Wage Regressions, IV: Task Characteristics**

	(1)	(2)
CIP	-0.197	-0.277
	(0.21)	(0.20)
CIP * High Skill	-0.178	-0.198*
	(0.12)	(0.11)
CIP * Routine	-0.297***	
	(0.06)	
CIP * Non-Routine		0.315***
		(0.06)
R-squared (within)	0.130	0.130
Observations	1657783	1657783
F-stat CIP	187	189
F-stat CIP*High	175	130
F-stat CIP*OCC	168	109
Other controls	Yes	Yes

Notes: Columns show regressions on log wages. Standard errors, clustered at the firm-year level, in parentheses. Other controls are log firm output, log firm size, log firm cap./lab., share high skill workers in firm, imports/sales, exports/sales, experience experience^2, married dummy, and union membership dummy, as well as job-spell fixed effects, region-year and industry-year dummies. *** p< 0.01, ** p< 0.05, * p< 0.10.

Table 11 – Mincer Wage Regressions, IV: Robustness

	China + CEEC	China + Poor Countries	Rich Countries	Exclude Small Firms	Exclude Zero-CIP Spells	Alternative CIP Definition	Drop Specific Industries
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IP	-0.293***	-0.465**	-0.020	-0.503**	-0.498***	-0.892***	-0.515***
	(0.09)	(0.22)	(0.01)	(0.20)	(0.17)	(0.27)	(0.18)
IP * High Skill	0.251**	0.102	-0.049***	0.514**	0.429**	0.765***	0.392**
	(0.12)	(0.28)	(0.02)	(0.23)	(0.19)	(0.29)	(0.20)
R-squared (within)	0.129	0.129	0.129	0.132	0.131	0.129	0.123
Observations	1688249	1688249	1688249	1438045	1598425	1688249	1343832
F-stat IP	204	79	257	184	279	237	250
F-stat IP*High	32	43	247	78	86	95	68
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Columns show regressions on log wages. Standard errors, clustered at the firm-year level, in parentheses. Other controls are log firm output, log firm size, log firm cap./lab., share high skill workers in firm, imports/sales, exports/sales, experience experience^2, married dummy, and union membership dummy, as well as job-spell fixed effects, region-year and industry-year dummies. CEEC: Cyprus, Estonia, Lithuania, Latvia, Malta, Poland, Czech Republic, Slovakia, Slovenia, Hungary, Romania, Bulgaria. Poor countries: Afghanistan, Albania, Angola, Armenia, Azerbaijan, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Burma, Cambodia, Central African Republic, Chad, Comoros, Republic of the Congo, Equatorial Guinea, Eritrea, Ethiopia, The Gambia, Georgia, Ghana, Guinea, Guinea-Bissau, Guyana, Haiti, India, Kenya, Laos, Lesotho, Madagascar, Maldives, Mali, Malawi, Mauritania, Moldova, Mozambique, Nepal, Niger, Pakistan, Rwanda, Saint Vincent and the Grenadines, Samoa, Sao Tome and Principe, Sierra Leone, Somalia, Sri Lanka, Sudan, Togo, Uganda, Vietnam, Yemen. Rich countries: EU15, United States, Japan. Booming industries are computers, cement, flat glass, and steel. *** $p< 0.01$, ** $p< 0.05$, * $p< 0.10$.

Table 12 – **Cumulative Earnings**

	OLS	2SLS			
	(1)	(2)	(3)	(4)	(5)
Δ CIP	-0.677	-2.725**	-2.692**	-1.198	-1.500
	(0.60)	(1.26)	(1.24)	(1.24)	(1.21)
Δ CIP * High Skill	1.834	5.849	5.930	2.959	2.478
	(1.54)	(4.05)	(4.04)	(4.08)	(3.95)
Δ CIP * Routine				-1.833**	
				(0.84)	
Δ CIP * Non-Routine					2.065**
					(0.94)
CIP 2001			-1.022	-1.478*	-1.332
			(0.95)	(0.88)	(0.90)
R-squared	0.027	0.027	0.027	0.028	0.028
Observations	178386	178386	178386	174847	174847
F-stat CIP		65	78	52	52
F-stat CIP*High		41	45	47	38
F-stat CIP*OCC				48	30
Other controls	Yes	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors, clustered at the firm level, in parentheses. Other controls are 2001 values of log firm output, log firm size, log firm cap./lab., share high skill workers in firm, imports/sales, exports/sales, experience experience^2, married dummy, and union membership dummy. *** p< 0.01, ** p< 0.05, * p< 0.10.

Table 13 – Other Cumulative Regressions: 2SLS

	Cumulative Transfers			Cumulative Unemployment			Cumulative Employment		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Δ CIP	-0.134	-0.792**	-0.647*	-0.012	-0.051**	-0.040*	-0.063	0.061	0.027
	(0.40)	(0.35)	(0.36)	(0.02)	(0.03)	(0.02)	(0.05)	(0.05)	(0.05)
Δ CIP * High Skill	-2.909***	-1.192	-1.049	-0.145**	-0.059	-0.059	0.767***	0.461***	0.448***
	(1.00)	(0.76)	(0.70)	(0.06)	(0.05)	(0.04)	(0.21)	(0.17)	(0.14)
Δ CIP * Routine		0.757***			0.044***			-0.146***	
		(0.20)			(0.01)			(0.04)	
Δ CIP * Non-Routine			-0.823***			-0.043***			0.150***
			(0.25)			(0.02)			(0.05)
CIP 2001	0.472	0.462	0.403	0.020	0.017	0.014	-0.032	-0.035	-0.024
	(0.50)	(0.49)	(0.50)	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.05)
R-squared	0.032	0.031	0.031	0.036	0.035	0.035	0.049	0.046	0.046
Observations	178386	174847	174847	178386	174847	174847	178386	174847	174847
F-stat CIP	78	52	52	78	52	52	78	52	52
F-stat CIP*High	45	47	38	45	47	38	45	47	38
F-stat CIP*OCC		48	30		48	30		48	30
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors, clustered at the firm level, in parentheses. Other controls are 2001 values of log firm output, log firm size, log firm cap./lab., share high skill workers in firm, imports/sales, exports/sales, experience experience^2, married dummy, and union membership dummy. *** $p< 0.01$, ** $p< 0.05$, * $p< 0.10$.

Table 14 – Employment Decomposition: 2SLS

	Cumulative Employment	Ini. Industry Ini. Occupation	Ini. Industry New Occupation	New Industry Ini. Occupation	New Industry New Occupation
	(1)	(2)	(3)	(4)	(5)
Δ CIP	-0.063	0.829***	-0.097	-0.393***	-0.402***
	(0.05)	(0.27)	(0.19)	(0.14)	(0.14)
Δ CIP * High Skill	0.767***	-1.144**	1.345**	-0.039	0.605**
	(0.21)	(0.54)	(0.54)	(0.11)	(0.24)
CIP 2001	-0.032	0.503***	-0.290***	-0.025	-0.220**
	(0.04)	(0.19)	(0.10)	(0.12)	(0.11)
R-squared	0.049	0.080	0.021	0.044	0.066
Observations	178386	178386	178386	178386	178386
F-stat CIP	78	78	78	78	78
F-stat CIP*High	45	45	45	45	45
Other controls	Yes	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes

Notes: Columns (2) through (4) decompose cumulative employment into its components. Standard errors, clustered at the firm level, in parentheses. Other controls are 2001 values of log firm output, log firm size, log firm cap./lab., share high skill workers in firm, imports/sales, exports/sales, experience experience^2, married dummy, and union membership dummy. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.1 – **Mincer Wage Regressions: Industry CIP**

	Fixed Effects		IV	
	(1)	(2)	(3)	(4)
Δ CIP	-0.079***	-0.105***	0.089	0.022
	(0.03)	(0.03)	(0.07)	(0.07)
Δ CIP * High Skill		0.173***		0.364***
		(0.02)		(0.04)
R-squared	0.129	0.129	0.129	0.129
Observations	1643447	1643447	1643447	1643447
F-stat CIP			167	208
F-stat CIP*High				74
Other controls	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes

Notes: Standard errors, clustered at the firm-year level, in parentheses. Other controls are log firm output, log firm size, log firm cap./lab., share high skill workers in firm, imports/sales, exports/sales, experience experience^2, married dummy, and union membership dummy, as well as job-spell fixed effects, region-year and industry-year dummies. *** $p< 0.01$, ** $p< 0.05$, * $p< 0$.