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ABSTRACT

Product Demand Shifts and Wage Inequality*

The UK and the US have experienced both rising skill premia and rising employment of skilled workers since the 1980s. These trends are typically interpreted as concurrent shifts of relative skill supplies and demands, and the demand shifts are attributed to skill-biased technological change or changes in international trade patterns. If more skilled workers demand more skill-intensive goods, then an exogenous increase in relative skill supplies will also induce a shift in relative demand. This channel reduces the need to rely on technology and trade to explain the patterns in the data. I illustrate this mechanism with a simple two-sector general equilibrium model. The empirical part demonstrates that in the UK more educated and richer workers demand more skill-intensive goods. Calibration of the model suggests that this induced demand shift can explain 3% of the total relative demand shift in the UK between 1981 and 1997. The baseline model only explains between-industry shifts in skill upgrading and wage inequality, while empirically, most of these changes took place within industries. An extension of the model with different qualities of goods and labor can also explain some of the within-industry changes.

JEL Classification: J21, J31

Keywords: wage inequality, demand shifts, income elasticity

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1 Introduction

Wage inequality increased substantially in the US and UK during the 1980s. The 90-10 log wage differential for male workers increased from 0.9 to 1.17 from 1979 to 1994 in the UK and from 1.16 to 1.45 in the US (Katz and Autor, 1999). Wage differentials by education also increased sharply. College graduates in the US earned 41 percent more than high school graduates in 1980, by 1995 they earned 62 percent more (Autor, Katz and Krueger, 1998). In 1978, median wages of workers who left school after age 18 in the UK were 40 percent higher than those who left school at or before 16. By 1995 this differential had increased to over 60 percent (Machin, 1999). At the same time, the employment shares of college graduates rose from 19.2% in 1980 to 26.7% in 1996 in the US, and from 8% in 1980 to 13% in 1997 in the UK.

Although the pattern of the increase in wage inequality and the skill premium in the US and UK during the 1980s has been well documented, there is still much disagreement about the causes of the changes. All the theories are faced with the challenge of explaining why the demand for skills accelerated and the college premium increased soon after an unprecedented increase in the supply of skills during the 1970s and 1980s. Several reasons have been proposed to explain the shift of demand against low skilled workers, in particular: skill-biased technical change, trade liberalization and deunionization.

In the skill-biased technical change literature, Katz and Murphy (1992) claim that a steady growth in the relative demand for skilled workers combined with a slowing supply is the basis of the rise in wage inequality in the '80s and '90s. Other studies argue that there has been an acceleration in the relative demand for skills in the 1980s. The most popular studies are based on skill-biased technical change associated with changes in production techniques (Acemoglu, 1998), organizational change (Acemoglu, 1999), the reduction of the relative price of computers (Krusell et al., 1999) or the diffusion of "technological revolutions" (Aghion and Howitt, 1998).

The trade literature has instead focused on increased competition from developing countries. Increased trade will have an adverse effect on the demand for less skilled workers as long as import-competing industries are low skill intensive and exporting industries are high skill intensive (Wood, 1996). The trade explanation, however, is not supported by the evidence. First, trade with developing countries is only a very small proportion of the GDP of most industrialized countries and therefore is unlikely to have a big effect on wage inequality (Krugman, 1995). Second, although the trade

explanation implies a rise in the relative prices of skill-intensive goods in developed countries, empirical studies find little evidence of this (Sachs and Shatz, 1994; Krueger, 1997). Third, the trade explanation is based on the relocation of labor from low skill-intensive to high skill-intensive sectors. However, the empirical evidence indicates that most of the shift away from the low skilled took place as a result of within-industry changes (60% to 80%) rather than between-industry changes (Berman, Bound and Griliches, 1994; Katz and Murphy, 1992).

Some other studies argue that the change in wage setting institutions such as the decline of the unions and of the real value of the minimum wage can be associated with the increase in wage inequality (DiNardo et al., 1996; Lee, 1999). The main problem with this explanation is that in the US deunionization began much before wage inequality started to rise. In the UK, deunionization began later than the rise in wage inequality.

In this paper, I investigate another mechanism that can generate wage inequality. If more skilled workers demand more skill-intensive goods, then an exogenous increase in relative skill supplies will also induce a shift in relative demand. With non-homothetic preferences, an increase in the relative supply of skilled workers can shift demand for final products in favor of skill-intensive goods and contribute to explaining the rise in the relative demand for skills. Sectors whose technology requires a large proportion of skilled workers are becoming increasingly important in the economy. Skill-intensive industries such as financial services, insurance, health, education, pharmaceuticals, computers, and legal services have an increasing weight both in terms of wage bill share and share of total employment. If workers who enter those sectors tend to consume more of the goods produced by the same sectors, then an increase in their supply may help create additional demand for their own labor services. Part of the outward shift in the relative demand for skills can be explained by the shift in expenditure from low skill-intensive goods to high skill-intensive goods caused by the increase in the relative supply of skilled workers.

This paper is related to a recent literature that suggests that changes in supply of skills may induce changes in demand of skills. Acemoglu (1998) gives an explanation in terms of directed technical change. In that model an increase in the supply of college graduates increases the size of the market for technologies complementary to skills. This induces a change in the direction of technical change towards skill-complementary technologies and a shift of the relative demand for skills. In another paper, Acemoglu (1999) gives an interpretation in terms of organizational change. He suggests that when the fraction of skilled workers increase, profit maximizing firms tend

to create more jobs targeted for this group. When there are few skilled workers and the productivity gap between the skilled and unskilled is limited, firms create one type of job (one single level of capital) and pool across all types of workers. When the supply of skilled workers rises or their relative productivity increases, firms tend to differentiate the types of jobs they offer. Some firms invest in more capital than others and target skilled workers only. As a result, skilled workers work with a higher level of capital and wage inequality increases. In an expanding varieties model, Kiley (1997) shows that an increase in the supply of skills can induce skill-biased technical change and wage inequality. In Kiley's model, as in Acemoglu's (1998), the attractiveness of investing in skill-biased technology depends on the supply of the factor that complements that technology.

My paper differs from this literature in that the link between the rise in the skills supply and the rise in skills demand is due to consumption elasticities. The mechanism at work is the following: an increase in the supply of skilled workers moves the economy down the relative labor demand curve but at the same time higher income elasticities of skill-intensive goods raise the relative demand for skill-intensive goods and the relative demand of skilled labor. Two questions are addressed in this paper. First, is it true that richer and more educated workers tend to consume more skill-intensive goods? Second, how much can such a mechanism contribute to explaining the outward shift in the relative demand for skilled labor?

In the theoretical part of the work, I build a simple two-sector general equilibrium model using non-homothetic preferences and derive the condition that links the exogenous rise in the supply of skilled workers with the rise of wage inequality. The sign and the magnitude of this relationship depends crucially on the income elasticity of skill-intensive goods.

In the empirical part of the work, I try to establish whether rich consumers consume more skill-intensive goods. To do so, I adopt a three-step procedure. First, I match micro data on consumption from the UK Family Expenditure Survey (FES) to industry data from the UK Labour Force Survey (LFS). 46 consumption goods are matched to 46 industries that produce them at the manufacturing level. I then estimate income elasticities for each consumption good using the Almost Ideal System proposed by Deaton and Muellbauer (1980). Finally, to establish whether rich consumers tend to consume more skill-intensive goods, I regress income elasticities on the industry skill intensity.

In the course of this exercise I have to tackle an empirical problem: the 46 industries matched to the consumption goods represent only 25% of the wage bill and 28% of employment in the economy. I use Input-Output

tables to take into account the contribution of the industries that produce intermediate inputs and all those industries that do not have a direct match with any consumption good. Input-Output tables are also used to correct the skill intensity of those goods that are mostly imported, since imports do not contribute to the domestic relative demand of skills. The results indicate a positive relationship between income elasticities of consumption goods and the skill intensity of the producing industries.

The regression results demonstrate that skilled workers tend to consume more skill-intensive goods but cannot give us an idea of how much an increase in the relative supply of skilled workers can increase the relative demand of skilled workers through consumption elasticities. To estimate the quantitative importance of this mechanism, I calibrate the theoretical model using UK data between 1981 and 1997. In section 4, I give an estimate of the relationship between wage inequality and the relative supply of skills implied by the model. The result suggests that an income effect that favors skill-intensive goods can explain about 3 % of the total shift in relative labor demand.

The basic model explains labor demand shifts between sectors and considers wage inequality between different education groups. However, the empirical evidence indicates that 50% to 70% of the rise in wage inequality took place within groups with the same education (Juhn, Murphy and Pierce, 1993). Moreover, most of the shifts in relative labor demand occurred within industries rather than between different industries (Berman, Bound and Griliches, 1994; Katz and Murphy, 1992). In section 5, the model is extended to explain the increase in wage inequality within education group and labor demand shifts within industries. The extension considers production of goods of different qualities within industries and workers of different skills within the same education group. Unfortunately, the empirical exercise cannot investigate this extension of the model due to lack of data regarding consumption of goods of different qualities within industries. However, the theory can be tested indirectly by establishing whether income elasticities have risen over time.

The plan of the paper is as follows. Section 2 presents the basic model. Section 3 analyses the empirical evidence. Section 4 calibrates the model and gives an estimate of the contribution of income elasticities in explaining the shift in relative labor demand. Section 5 extends the model to explain wage inequality within education group and labor demand shifts within industry. Section 6 concludes.

2 The Model

In this section, I formalize the basic idea of the paper. If preferences are non-homothetic and skilled workers tend to consume more skill-intensive goods, then an increase in the supply of skilled workers increases the final demand for skill-intensive goods and shifts the relative demand for skilled labor.

The formal model builds on 2×2 production-consumption models used in the early trade and public finance theory. The economy consists of H skilled workers and L unskilled workers. Labor supply is considered to be exogenous and inelastic. There are two types of goods: Y_h, the high skill-intensive good and Y_l, the low skill-intensive good. The high skill-intensive good is produced using mainly skilled workers, the low skill-intensive good using unskilled workers. Production functions are assumed to be CES. Labor markets are competitive. Demands for goods have a generic form that allows for non-homotheticity, and are different for educated and non educated workers.

The aim of this model is to explain the concurrent increase in the relative supply and the relative demand of skilled workers (college graduates). The mechanism that shifts demand in response to an increase in supply acts through income elasticities. This model links the relative supply of skills to the skill premium through income elasticities of consumption.

The basic structure of the economy is:

Production:

$$Y_h = F_1(L_1, H_1) \tag{1}$$
$$Y_l = F_2(L_2, H_2) \tag{2}$$

Demand:

$$Y_h = Hy_h^h(\frac{p_h}{p_l}, w_h) + Ly_h^l(\frac{p_h}{p_l}, w_l) \tag{3}$$
$$Y_l = Hy_l^h(\frac{p_h}{p_l}, w_h) + Ly_l^l(\frac{p_h}{p_l}, w_l) \tag{4}$$

Factor supplies:

$$L = L_1 + L_2 \tag{5}$$
$$H = H_1 + H_2 \tag{6}$$

Factor returns:

$$w_h = p_h F_{1H}(L_1, H_1) = p_l F_{2H}(L_2, H_2) \quad (7)$$
$$w_l = p_h F_{1L}(L_1, H_1) = p_l F_{2L}(L_2, H_2) \quad (8)$$

Equation 3 is the total demand for the skill-intensive good Y_h. The first term of the RHS of equation 3 represents demand by the H skilled workers, the second term is demand by the L unskilled workers. Skilled and unskilled workers may have different price and income elasticities for skill-intensive goods. Equation 4 has the same interpretation for the low skill-intensive good Y_l.

The unskilled wage is normalized $w_l = 1$. The system is completely described by the following five equations:

$$p_h F_1(H_1, L_1) = L_1 + w_h H_1 \quad (9)$$
$$p_l F_2(H - H_1, L - L_1) = L - L_1 + w_h(H - H_1) \quad (10)$$
$$d\log(\frac{H_1}{L_1}) = -\sigma_1 d\log w_h \quad (11)$$
$$d\log(\frac{H - H_1}{L - L_1}) = -\sigma_2 d\log w_h \quad (12)$$
$$H y_h^h(\frac{p_h}{p_l}, w_h) + L y_h^l(\frac{p_h}{p_l}, 1) = F_1(H_1, L_1) \quad (13)$$

The first two equations, 9 and 10, restate the constant return assumption. Equations 11 and 12 are definitions of substitution elasticities in a CES technology. The last equation 13 is the market equilibrium condition for good Y_h. According to Walras' law, equilibrium in the market for factors and for good Y_h implies that the market for good Y_l clears.

Taking the total differential and logs:

$$d\log p_h = a_1 d\log w_h$$
$$d\log p_l = a_2 d\log w_h$$
$$d\log H_1 - d\log L_1 = -\sigma_1 d\log w_h$$
$$(1 + \lambda_H) d\log H - \lambda_H d\log H_1 + \frac{H}{L}(1 + \lambda_L) d\log H - \lambda_L d\log L_1 = -\sigma_2 d\log w_h$$

$$R_1[\varepsilon^h_{hp} d\log(\frac{p_h}{p_l}) + \varepsilon^h_{hm} d\log w_h + d\log H] +$$
$$+ (1-R_1)[d\log L + \varepsilon^l_{hp} d\log(\frac{p_h}{p_l})] = a_1 d\log H_1 - (1-a_1) d\log L_1$$

The parameter $a_1 = \frac{w_h H_1}{p_h y_h}$ denotes the wage bill share of skilled labor in the high skill-intensive sector h, a_2 is the wage bill share of skilled labor in the low skill-intensive sector l. $\lambda_H = \frac{H_1}{H-H_1}$ and $\lambda_L = \frac{L_1}{L-L_1}$ are respectively the ratio of skilled labor used in sector h and l and the ratio of unskilled labor used in sector h and l. $R_1 = \frac{Hy^h_h(.)}{Hy^h_h(.)+Ly^l_h(.)}$ is the share of total expenditure for the skill-intensive good due to skilled labor. ε^i_{hp} is the price elasticity of demand for the skill-intensive good h. The index $i = h, l$ indicates that the elasticity may be different for the skilled and unskilled workers. ε^h_{hm} is the income elasticity of demand for the skill-intensive good.

The system is solved for dw_h as a function of dH. Assume that $dH = -dL$, i.e. the total labor supply is fixed. The result is:

$$\frac{d\log w_h}{d\log H} = \frac{(\lambda_H + \lambda_L)[R_1 - (1-R_1)\frac{H}{L}] - (2a_1 - 1)[1 + \lambda_H + \frac{H}{L}(1+\lambda_L)]}{-(\lambda_H + \lambda_L)T - (2a_1 - 1)(\lambda_L \sigma_1 - \sigma_2)} \tag{14}$$

where $T = \{R_1[\varepsilon^h_{hp}(a_1 - a_2) + \varepsilon^h_{hm}] + (1-R_1)\varepsilon^l_{hp}(a_1 - a_2) + (1-a_1)\sigma_1\}$. We know that $a_1 - a_2 > 0$ because sector Y_h is skill intensive. Equation 14 establishes the condition that links wage inequality $\frac{w_h}{w_l}$ to a rise in the skill ratio $\frac{H}{L}$ in this model that takes into account the shift in the demand for products due to the income effect. The sign and the magnitude of the numerator will depend crucially on the value of $R_1 = \frac{Hy^h_h(.)}{Hy^h_h(.)+Ly^l_h(.)}$, the share of total expenditure for the skill-intensive good due to skilled workers, and on $a_1 = \frac{w_h H_1}{p_h y_h}$, the wage bill share of skilled labor in the skill-intensive sector. The sign and the magnitude of the denominator depend from ε^h_{hm}, the income elasticity in skilled workers' demand for skill-intensive goods.

An increase in the supply of college graduates has two effects. The standard substitution effect moves the economy along a downward sloping relative demand curve and decreases the skill premium. The effect through income elasticities may raise the demand of skill-intensive goods and therefore the relative demand of skilled labor. An implication of the model is the increase over time of the demand of consumption items with large income elasticities, concurrently with the increase in the relative supply of skilled labor.

This model can offer an explanation of the increase in the relative labor demand for skilled labor in its between-industry component, but it does not explain labor demand shifts within industry nor does it explain the rise of wage inequality within education groups. In section 5, I extend the model to explain within-group wage inequality and within-industry labor demand shifts and provide a test of the theory.

3 The Empirical Evidence

Figure 1 documents the concurrent rise of the relative employment and the relative wage of university graduates in the UK from 1978 to 1997 using the UK Family Expenditure Survey (FES). The percentage of heads of household with a university degree rose from 8% in 1978 to 13% in 1997. During the same period, the ratio of the average wage of heads of household with a university degree over the average wage of heads without a degree rose from 2 to 2.7.

An increase in the supply of college graduates can generate an increase in the demand for skills if skilled workers prefer consuming skill-intensive goods. The hypothesis that income elasticities for high skill-intensive goods are higher than for low skill-intensive goods is crucial in deriving the main result of the paper. In this section, I relate income elasticities of consumption goods to the skill intensity of the producing industry using UK data. I match two datasets: the UK Family Expenditure Survey (FES) which contains data on consumption, and the UK Labour Force Survey (LFS) which contains data on industry skill intensity. I then estimate income elasticities for each consumption item and regress the estimates on the skill intensity of the producing industry.

3.1 The Match Industry-Consumption Item

To obtain the data on consumption I use the Family Expenditure Survey from 1981 to 1997. The survey contains information on a detailed set of goods recorded in a two-week diary and on household composition. I use data on all the goods whose consumption has been consistently recorded from 1981 to 1997. I consider consumption of 46 goods as shown in table 3 in the Appendix. All expenditures are recorded in pounds at current prices and refer to weekly expenditure. Except for insurance and education, all the items are part of the two-week diary and are aimed at measuring recurrent weekly expenditures. Insurance refers to the last premium paid and education to the amount spent in the previous year on tuition fees and

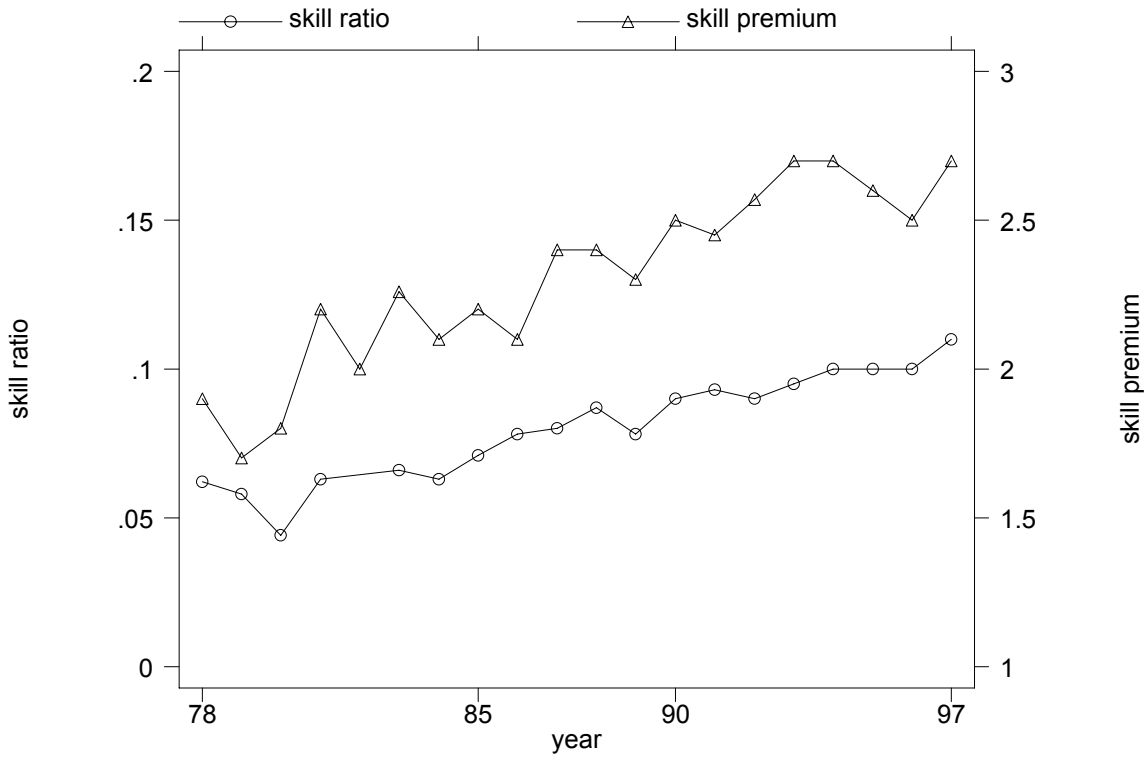

Figure 1: Percentage of heads of household with 16 or more years of education. Ratio of average wages of workers with a university degree over average wages of workers with less than university degree education. Source: FES data.

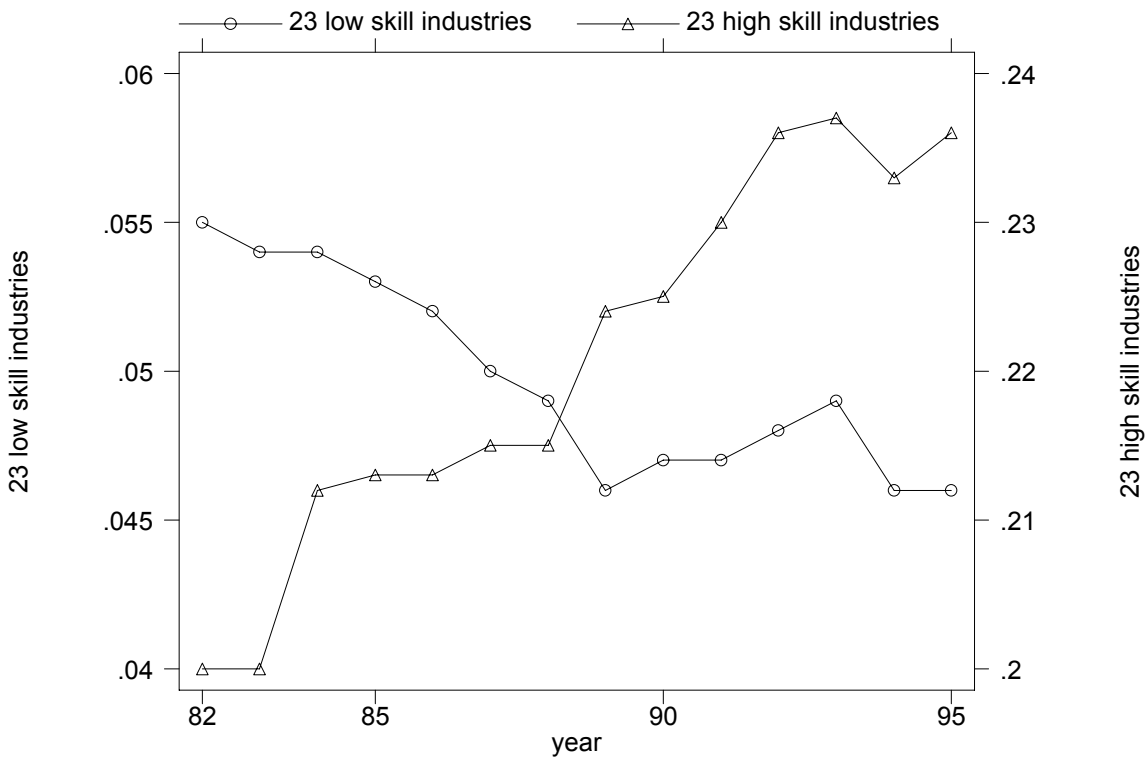

Figure 2: Wage bill share of the 23 most skill intensive and 23 least skill intensive industries 1982-1995. Source: NES data

maintenance. The amount reported for insurance and education is translated into weekly equivalents i.e. the total amount reported in the questionnaire is divided by 52.[1]

I match all 46 consumption goods to their manufacturing industry and rank the industries according to their skill intensity. Skill intensity is calculated as the industry's percentage of workers with a university degree. The data on industry skill intensity are taken form the Labour Force Survey from 1981 to 1997. In table 3 in the Appendix, I rank the industries from the least skill intensive to the most skill intensive.

Figure 2 shows the increasing weight in the economy of the 23 most skill-intensive industries compared to the 23 least skill intensive. The wage data are taken from the National Earnings Survey. The proportion in the total wage bill of the 23 most skilled industries combined rose from 20% in 1982 to 23.7% in 1995. The proportion in the wage bill of the 23 least skill intensive declined from 5.5% to 4.6%. In total the 46 industries that have a direct match to a consumption item represent 25% of the total wage bill share and 28% of total employment.

3.2 The Income Elasticities

Table 4 in the Appendix shows the means of the FES data and the expenditure shares of the main consumption items for families in the bottom quintile of the earnings distribution and families in the top quintile.

Figure 3 plots the ratio of expenditure on the 10 most skill-intensive goods over expenditure on the 10 least skill intensive against the net income decile. The 10 industries with the highest percentage of graduate workers include education, medical practices, legal services, radio and TV, trade unions, recreational services, mineral oil extraction, pharmaceuticals, soap and toilet products, banking. The 10 least skill-intensive industries include hairdressing, fish processing, cleaning services, footwear, laundry, bread, meat production, takeaway, outerwear, post services. Families in all income deciles except the top decile spend in absolute terms more on low skill-intensive goods such as food. However, the ratio of expenditure on the 10 most skill-intensive goods over expenditure on the 10 least skill-intensive goods increases with income and goes from 0.6 for the lower deciles to 1.2

[1] The recorded expenditure for not very popular items contain many zeros. Weekly expenditure on education fees and maintenance for year 1997 is on average 4.63 pounds, the last premium paid on life and health insurance is 3.08 pounds on average. Conditional on a positive amount, the average expenditure on education and on insurance premiums are respectively 20 pounds and 7.6 pounds.

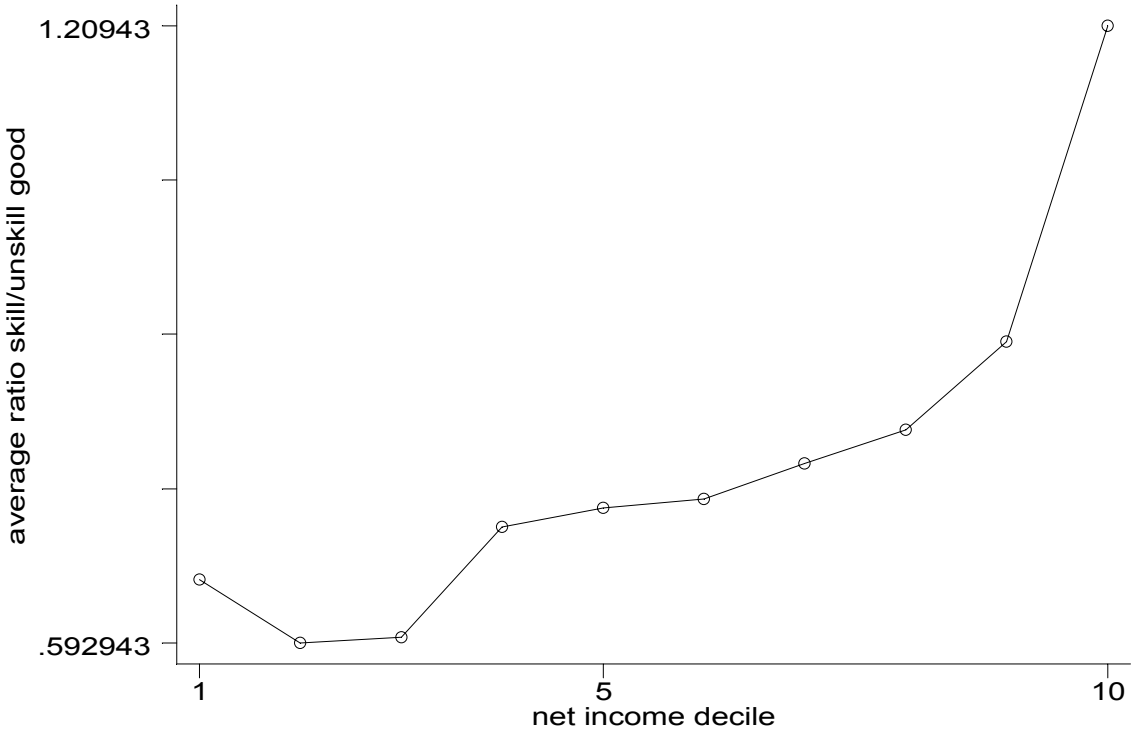

Figure 3: Ratio of expenditure on the 10 most skill intensive goods and the 10 least skill intensive goods, by income decile.

for the 10th decile.

3.2.1 Almost Ideal Demand System

The estimation method for income elasticities is the Almost Ideal Demand System proposed by Deaton and Muellbauer (1980). The expenditure decision is modelled following the two-stage budgeting approach (Blundell et al., 1993). At each period t, each household h makes a decision on how much to consume conditional on various household characteristics and conditional on the consumption level of a second group of other demands. This latter group contains housing and durables such as cars that are not considered in the estimation. Let us suppose that the two groups are weakly separable in utility and therefore prices of housing and durables do not affect consumption of the goods we are going to consider. Let us also suppose that preferences

are weakly separable over time and therefore incomes and prices outside the period have no effect on the current period consumption decision.

Let y_t be expenditure allocated by a household to these goods in period t. Given y_t, the household decides how much to spend on individual goods according to the following share equation (Deaton, 1980, time subscripts omitted):

$$\omega_i = \alpha + \beta_i \log(\frac{y}{P}) + \sum_{j=1}^{n} \zeta_{ij} \log p_j + \theta_i X + \varepsilon_i \tag{15}$$

where $\omega_i = \frac{p_i x_i}{y}$ is the expenditure share of item i. $\log y$ is log total expenditure. $P = \sum_j w_j \log\, p_j$ is the Stone price index where w_j is the monthly average share of good j in the data set. $\log p_j$ are the items' price series.[2] X contains a quadratic in age, sex and education of the head of household, regional dummies, the total number of components and the number of children in the household. The budget elasticity will be equal to:

$$\widehat{\eta}_i = \frac{\widehat{\beta}_i}{\overline{\omega}_i} + 1$$

where $\overline{\omega}_i$ is the average budget share of item i.

The system estimation is carried out by using a two-step procedure. In the first stage, each equation is estimated separately instrumenting total expenditure. The need to consider total expenditure as an endogenous variable comes from the occurrence of zero expenditures in the diary records. Many of the commodity groups considered, especially alcohol and tobacco are purchased infrequently. Since the zero expenditures affect both the dependent variable and the total real expenditure $\log(\frac{y}{P})$, ordinary least square OLS will be biased. Instrumental variable estimation, permitting all terms in $\log(\frac{y}{P})$ to be endogenous, removes this measurement error problem. Total net income and the real interest rate are used as instruments. The real interest rate is included as it may bear on intertemporal substitution and therefore affect total expenditure in year t. In the first stage, single equation restrictions such as zero-degree homogeneity in prices are also imposed.

Given the first-step estimates, the symmetry cross-equation restrictions are imposed by means of a minimum distance estimator. The symmetry

[2] The category "other personal expenditures" aggregates goods whose price series are not available. For this group I use the general Consumption Price Index.

cross-equation restrictions are $N*(N-1)/2$ symmetry restrictions on the price coefficients: $\zeta_{ij} = \zeta_{ji}$. Denoting ϕ the vector of unrestricted parameters and ϕ^* the restricted parameters, the symmetry restrictions can be expressed as:

$$\phi = R\phi^*$$

To impose the symmetry restrictions the Minimum Distance estimator chooses ϕ^* to minimize:

$$m = (\widehat{\phi} - R\phi^*)' \Sigma_{\phi}^{-1} (\widehat{\phi} - R\phi^*) \tag{16}$$

where $\widehat{\phi}$ are the first-step estimates and Σ_{ϕ}^{-1} is an estimate of the variance-covariance matrix. The minimized value of the quadratic form in 16 is an optimal χ^2 test of the restrictions. In this case there are N =46 homogeneity restrictions plus $N*(N-1)/2$ =1035 symmetry restrictions.

Table 5 in the Appendix reports the symmetry constrained estimates of the income elasticities. The table shows the coefficients $\widehat{\beta}_i$ on real log total expenditure with the standard error in parenthesis, and the corresponding budget elasticity. Each row shows the results of a single share equation. The income elasticities are always very precisely estimated. The constrained estimates are statistically rejected, but the estimates of the income elasticities are only marginally affected by the imposition of the restrictions. The constrains affect mostly the price elasticities which are not relevant for the purpose of this paper.

The results indicate that high skill-intensive products have in general a higher income elasticity than low skill-intensive products. In particular, expenditure on skill-intensive services such as education, legal and medical services all have a budget elasticity much bigger than one. Expenditures on some skill-intensive products like drugs, soap and cosmetics, and books have an elasticity lower than one. Most low skill-intensive products have an income elasticity lower or just over one except for cleaning services which seem to be a luxury good.

Finally, I run a regression of the estimated income elasticities on the corresponding industry's skill intensity. This regression gives us an idea on whether rich consumers tend to consume more skill-intensive goods. I estimate:

$$\widehat{\eta}_i = \alpha + \gamma z_i + \varepsilon_i \tag{17}$$

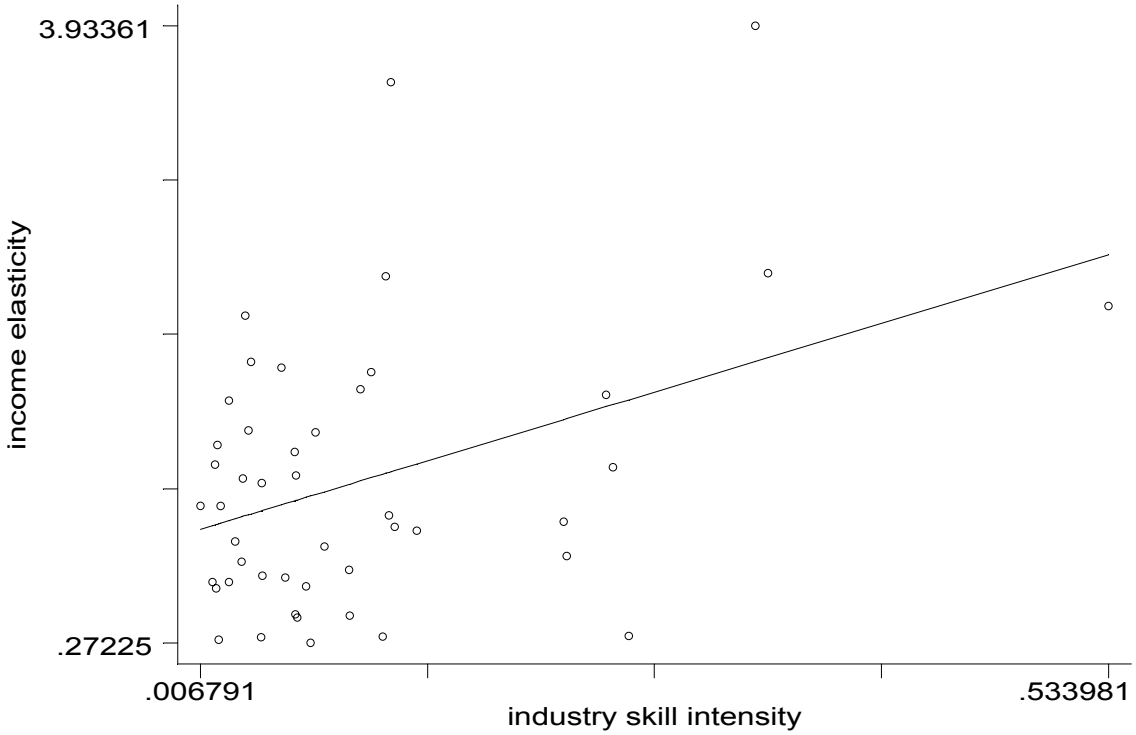

Figure 4: OLS regression of income elasticities on industry skill intensity.

where $\widehat{\eta}_i$ is the estimate of income elasticity for good i and z_i is industry i skill intensity. Skill intensity is defined as the percentage of workers with a degree that work in industry i, as reported in table 3 in the Appendix. Standard errors are corrected for heteroschedasticity. The results of the estimation are given in the first column of table 1. The regression gives a coefficient γ =3.08(1.06) and $R^2 = 0.16$. A positive relationship between income elasticities and skill intensity indicates that rich consumers indeed consume more skill-intensive goods. Figure 4 plots the estimated elasticities against skill intensity.

3.2.2 Input Output Tables

Matching consumption items directly to the industries that produce them at the manufacturing level, I disregard the retail sector and all other sectors that do not have a direct match to a consumption item. Furthermore, I do

not consider intermediate goods or the import penetration in the different sectors. Intermediate goods may be important because the industries that produce the inputs may have a different skill intensity than those that produce the final output. The import penetration in the different industries is relevant because consumption goods with very high income elasticities may be mainly produced abroad and therefore contribute nothing to the increase in the domestic demand for skilled labor.

To account for the skill intensity of the industries that produce inputs and of the sectors that do not have a match to a consumption item, I use the OECD domestic transaction Input-Output tables for the UK in year 1990. In table 6 in the Appendix I match the LFS industry classification to the OECD industry classification. The contribution of intermediate inputs is taken into account by calculating the skill intensity of an industry as the weighted average of the skill intensity of its inputs. The Input-Output table provides the weights. Industry j skill intensity is calculated as the weighted average of the skill intensity of the i industries that produce intermediate inputs: $z_j^A = \sum_i \frac{I_{ij}}{\Sigma_i I_{ij}} z_i$. In this expression $\frac{I_{ij}}{\Sigma_i I_{ij}}$ is industry i input contribution into production of one unit of product j. z_i is skill intensity of industry i.

The results of regression 17 calculated using skill intensities corrected for the contribution of intermediate inputs and the retail sector, are given in table 1. This regression gives a result of γ =5.14(3.84). The relationship between income elasticities and skill intensity is stronger than before. Since the retail sector is very low skilled, it is expected to reduce the skill intensity of all goods. The effect of the retail sector on the skill intensity of all products is more than offset by the contribution of industries that produce intermediate inputs which are relatively more skill intensive.

To the extent that we want to answer the question whether skilled workers consume more skill-intensive goods, we are interested in the relationship between income elasticities for domestic products and skill intensity of domestic production. In this case, skill intensity does not need to be weighted by the import penetration of the corresponding industry, and the relevant results are those of the second column of table 1, where skill intensity is corrected for the contribution of intermediate inputs and the retail sector.

However, for the purpose of assessing how much an increase in income may increase the demand for skilled labor through income elasticities, we should weight the skill intensity of the manufacturing industry for imports since imported goods are not going to increase domestic demand for labor. Skill intensity z_j^A is therefore multiplied by the import penetration of the final industry. The import penetration of industry j, NX_j , is calculated

	Regression 1 Skill intensity=z_i	Regression 2 Skill intensity=z_i^A	Regression 3 Skill intensity=$z_i^A * NX_i$
Skill intensity	3.08 (1.06)	5.14 (3.84)	9.63 (4.50)
R square	0.16	0.04	0.10
Sample size	46	46	46

Notes: First column, skill intensity of manufacturing industry. Second column, skill intensity corrected for intermediate inputs. Third column, skill intensity corrected for intermediate inputs and import penetration.

Table 1: OLS regression of income elasticities on skill intensity

as $NX_j = 1 + (E_j - I_j)/Y_j$. Where E_j, I_j and Y_j are exports, imports and total production of industry j. In this case, regression 17 gives a result of γ =9.63(4.50) as shown in table 1. The higher value of the regression coefficient reflects the fact that the UK exports skill-intensive goods and imports low skill-intensive goods.

Table 1 compares the results of regression 17 in three cases. In the first column, skill intensity z_i is simply the skill intensity of the producing industry, in the second column, skill intensity is corrected for the contribution of intermediate goods and the retail sector, z_i^A, in the third column skill intensity is corrected for intermediate goods, the retail sector and import penetration, $z_i^A * NX_i$. The relationship between income elasticities and skill intensity, the coefficient γ, is always positive and significative. A positive value of γ indicates that rich consumers tend to consume more skill-intensive goods. However, this coefficient does not say how much an increase in income raises the demand for skilled labor.

To answer that question, I attempt to quantify the explanatory power of the model with respect to the implied rise in the demand for skilled labor and wage inequality. In the next section, I calibrate the model using the data of the UK economy.

4 Model Calibration

This section describes a calibrated version of the model, choosing parameters in line with the UK economy. I quantify the increase in the relative demand of skilled labor in response to an increase in the relative supply of skills making use of the relationship between the skill premium and the skill ratio implied by the model of section 2.

The calibration of the model is conducted using data on the 46 industries that match the consumption items as in table 1 in the Appendix. The 46 industries are divided into 23 low skill-intensive sectors and 23 high skill-intensive sectors to match the characteristics of the model of section 2. The 46 industries represent 25% of total employment and 28% of the total wage bill. Calibration of equation 14, obtained from the model of section 2, will give an idea of the importance of income elasticities in explaining the rise of wage inequality. I report equation 14 for convenience:

$$\frac{d\log w_h}{d\log H} = \frac{(\lambda_H+\lambda_L)[R_1-(1-R_1)\frac{H}{L}]-(2a_1-1)[1+\lambda_H+\frac{H}{L}(1+\lambda_L)]}{-(\lambda_H+\lambda_L)T-(2a_1-1)(\lambda_L\sigma_1-\sigma_2)}$$

where $T=\{R_1[\varepsilon^h_{hp}(a_1-a_2)+\varepsilon^h_{hm}]+(1-R_1)\varepsilon^l_{hp}(a_1-a_2)+(1-a_1)\sigma_1\}$.

Using LFS data from 1981 to 1997, I obtain a measure of skill intensity for the 23 most skill-intensive and the 23 least skill-intensive industries: $\lambda_H=\frac{H_1}{H_2}=23.1$ and $\lambda_L=\frac{L_1}{L_2}=1.98$. The total skill ratio in the economy is $\frac{H}{L}=0.11$. The share of the skilled in total expenditure for the skill-intensive good $R_1=\frac{Hy^h_h(.)}{Hy^h_h(.)+Ly^l_h(.)}=0.12$. The value of the wage bill share of skilled work in the skill-intensive sector $\alpha_1=\frac{w_hH_1}{p_hy_h}=0.48$ while $\alpha_2=\frac{w_hH_2}{p_ly_l}=0.1$. An estimate of the income elasticity $\varepsilon^h_{hm}=\frac{\widehat{\beta}}{\overline{\omega}}+1$ is obtained from a fixed effect regression considering only the 23 most skill-intensive goods and only educated workers. The standard errors of this regression are clustered at the household level. I obtain a value of $\beta=0.004(0.000)$. The average mean share among the 23 skilled goods in total expenditure for the educated workers is $\overline{\omega}=0.015$. This implies an income elasticity ε^h_{hm} =1.28. The price elasticities ε^h_{hp} and ε^l_{hp} are estimated from two separate fixed effect regressions which consider in turn only educated and only non-educated workers. They are estimated at ε^h_{hp} =-0.7(0.2) and ε^l_{hp} =-0.6(0.1). The value for the elasticity of substitution $\sigma_1=\sigma_2=1.4$ is taken from Katz and Murphy (1992). The final result is $\frac{d\log w_h}{d\log H}=-0.32$.

In the UK economy, between 1981 and 1997, $\frac{H}{L}$ increased by 120% and $\frac{w_h}{w_l}$ increased by 20%. An increase in $\frac{H}{L}$ has two effects. It moves the skill premium $\frac{w_h}{w_l}$ down the relative labor demand and, at the same time, generates an income effect that increases the demand of skill-intensive goods and shifts out the relative demand for skilled labor. Given the value $\frac{d \log w_h}{d \log H} = -0.32$, this model implies that $\frac{w_h}{w_l}$ should fall by 38% as a result of an increase in $\frac{H}{L}$ of 120%. The same model, solved with homothetic preferences ($\varepsilon^h_{hm} = 1$) that disregard the income effect in favor of skill-intensive goods, implies a fall in $\frac{w_h}{w_l}$ of 40%. Assuming this value as a benchmark, the total shift in relative labor demand is of 60% (the actual 20% plus the counterfactual 40% along a fixed relative demand curve). These calculations imply that income elasticities can explain only around 3% of the total shift in the relative demand of labor. The effect of the income elasticity reduces by 2% the fall of the relative wage along the relative demand curve (38% instead of 40%). These 2% points constitute only 3% of the 60% shift in the relative labor demand.

5 Within-Group Wage Inequality

Juhn, Murphy and Pierce (1993) attribute from one half to two thirds of the total increase in wage inequality in the US to wage differentials within observable individual characteristics. Katz and Murphy (1992) show that between industry shifts in the composition of employment are not enough to account for the total shift in the relative demand for skills in the US. Most of the shift in relative labor demand occurs within detailed industries. Machin and van Reenen (1998) show that within-industry shifts are predominant across a sample of OECD countries.

In this section, the model of section 2 is extended to account for within-education group wage inequality and within-industry labor demand shifts. To explain within-education wage inequality and within-industry relative labor demand shifts, it is necessary to introduce goods of different qualities within sectors and workers of different skills within education group. I introduce goods of high and low quality within both the high skill-intensive and the low skill-intensive sectors and high skilled and low skilled workers within both the educated and the non-educated workers.

Let us assume that only educated workers work in the skill-intensive sector. Furthermore let us assume that within the educated only those who are skilled produce high quality goods, the unskilled produce low quality goods. The same applies to the low skill-intensive sector where only non-

educated workers work. Assume furthermore that as consumers become richer not only do they want to consume more high skill-intensive goods but they also want to consume more high quality goods within each of the two sectors: preferences are non-homothetic in goods and non-homothetic in quality. This produces the result that an income effect increases the demand of high quality goods in both sectors and therefore the wage of skilled workers that produce those goods in both sectors. This model generates an increase in residual wage inequality as long as we assume that the skills of those who produce high or low quality goods are not observable.

In formal terms, the model can be specified as follows. There are four types of workers differentiated by education and unobserved skills. There are four sectors in the economy and each of them produces using only one type of worker. The production functions in the skill-intensive sector where all the H educated workers work are of the type:

$$y_{hj} = H_j \quad \text{where } j = s, u$$

H_s skilled educated workers produce high quality goods in the skill-intensive sector of the economy. H_u unskilled educated workers produce low quality goods. By the same token the production functions in the low skill-intensive sector are of the type:

$$y_{lj} = L_j \quad \text{where } j = s, u$$

I assume that the fraction of skilled workers in each education group is constant with $\phi_h = \frac{H_s}{H_u} > \phi_l = \frac{L_s}{L_u}$. The proportion of skilled workers among the educated is bigger than among the uneducated. In this model, within-group wage inequality is given by:

$$\frac{w_{hs}}{w_{hu}} = \frac{p_{hs}}{p_{hu}}\phi_h$$

and

$$\frac{w_{ls}}{w_{lu}} = \frac{p_{ls}}{p_{lu}}\phi_l$$

The equilibrium in the model is given by four zero-profit conditions and three market clearing conditions of the type:

$$\phi_h H_u y_{ij}^{hs}(\frac{p_{ij}}{p}, w_{hs}) + H_u y_{ij}^{hu}(\frac{p_{ij}}{p}, w_{hu}) + \phi_l L_u y_{ij}^{ls}(\frac{p_{ij}}{p}, w_{ls}) + L_u y_{ij}^{lu}(\frac{p_{ij}}{p}, 1) = y_{ij}$$

where $y_{ij}^{ij}(\frac{p_{ij}}{p}, w_{ij})$ for $i = h, l$ and $j = s, u$ is the demand for each of the four types of goods by each of the four types of workers. Total demand is equal to production y_{ij}. The last market clearing condition is satisfied by Walras' law.

Normalize total labor supply $H + L = 1$. Consider an increase in the supply of educated workers H (in this case an increase in H_u and a proportional increase in $H_s = \phi_h H_u$) and the corresponding decrease of the non-educated L. The condition that ensures an increase in within-group wage inequality in the skill-intensive sector is:

$$\frac{\delta \log w_{hs}}{\delta \log H_u} > \frac{\delta \log w_{hu}}{\delta \log H_u} \Longleftrightarrow \epsilon_{hm}^s > \epsilon_{hm}^u$$

To generate wage inequality within the educated in the skill-intensive sector, the model requires the income elasticity of the high quality goods to be greater than the income elasticity of low quality goods. The test of this extension of the model has to take an indirect route because consumption surveys do not have information about the quality of the goods purchased. The estimated income elasticities are going to be averages of the income elasticities of high quality and low quality goods:

$$\epsilon_{hm} = \frac{y_h^s \epsilon_{hm}^s + y_h^u \epsilon_{hm}^u}{y_h^s + y_h^u}$$

The demands for high quality and low quality goods within the high skill-intensive sector, y_h^s and y_h^u , are unobservable. We have only total demand of a skill-intensive good $y_h^s + y_h^u$ and the corresponding income elasticity ϵ_{hm}. The hypothesis that high quality goods have a higher income elasticity than low quality goods can be tested looking at the evolution of elasticities over time. If the hypothesis $\epsilon_{hm}^s > \epsilon_{hm}^u$ is correct, then over time, we should observe a higher relative demand of high quality goods y_h^s and a rise in the estimated elasticity ϵ_{hm}. In fact $\frac{\delta \epsilon_{hm}}{\delta y_h^s} > 0$ if $\epsilon_{hm}^s > \epsilon_{hm}^u$. For the low skill-intensive sector we should observe a shift of demand from y_l^u to y_l^s, but also a decline in total demand for low skill-intensive goods, $y_l^s + y_l^u$.

To test this implication of the model I estimate a fixed effect model where I regress income elasticities estimates in each year of the sample on a time trend and a dummy for each good:

Dependent Variable	Income elasticities full sample	Income elasticities High skill-intensive goods	Income elasticities Low skill-intensive goods
Trend	0.006	0.017	0.004
	(0.001)	(0.001)	(0.000)
Trend*skill intensity	0.02		
	(0.005)		
R square	0.97	0.96	0.94
Sample size	552	276	276

Notes: Weighted regression

Table 2: Fixed effect regression of income elasticities on time trend

$$\widehat{\eta}_{it} = \alpha + \beta t + \xi_i + \varepsilon_{it}$$

where $\widehat{\eta}_{it}$ is the estimated income elasticity of good i in year t, t is a time trend and ξ_i is a dummy for each good. Each observation is weighted by the inverse of its variance. In table 2, I present the results on the whole sample where the time trend is interacted with skill intensity and separately on the sample of the 23 most skill-intensive goods and on the sample of the 23 less skill-intensive goods. The results for both the skilled and unskilled sectors show a rising trend in the estimated income elasticities. The results on the whole sample show a stronger rising trend for the more skill-intensive goods.

6 Conclusions

In this paper I claim that the shift of relative labor demand for skills does not need to be attributed exclusively to skill-biased technical change or trade. The shift in relative labor demand can be at least partially explained by an income effect that increases the demand of skill-intensive products. If more skilled workers demand more skill-intensive goods, then an exogenous increase in the relative supply of skills can induce a shift in relative labor demand for skills.

I build a very simple general equilibrium model where I relate wage inequality and the skill ratio when preferences are non-homothetic. In the empirical part of the paper, I match data on consumption to data on industry skill intensity. I show that richer and more educated people tend to consume a larger proportion of skill-intensive goods. This result holds even after I correct skill intensity to take into account the contribution of intermediate inputs and import penetration. Simple calibration of the model suggests that the estimated income elasticities of consumption of skill-intensive goods can explain around 3% of the total increase in relative labor demand for skills in the UK from 1981 to 1997. Finally, I extend the model to explain wage inequality within education group and labor demand shifts within industry. I also give an indirect empirical test of this extension of the model which suggests that income elasticities of the consumption goods considered have increased over time.

References

[1] Acemoglu, D. (1998), "Why Do New Technologies Complement Skills? Directed Technical Change and Wage Inequality", *Quarterly Journal of Economics*, 113, 1055-1090.

[2] Acemoglu, D. (1999), "Changes in Unemployment and Wage Inequality: An Alternative Theory and Some Evidence", *American Economic Review,* 89, 1259-1278.

[3] Aghion, P. and P. Howitt (1998), "On the Macroeconomics Effects of Major Technological Changes" in *General Purpose Technology and Growth*, E. Helpman ed., the MIT Press.

[4] Autor, D., L. Katz and A. Krueger (1998), "Computing Inequality: Have Computers Changed the Labor Market?", *Quarterly Journal of Economics*, 113, 1169-1213.

[5] Berman, E., J. Bound and S. Machin (1998), "Implications of Skill-Biased Technical Change, International Evidence", *Quarterly Journal of Economics*, 113, 1245-1280.

[6] Blundell, R., P. Pashardes and G. Weber (1993), "What do We Learn About Consumer Demand Patterns from Micro Data?", *American Economic Review,* 89, 570-597.

[7] Bound, J. and G. Johnson (1992), " Changes in The Structure of Wages in the 1980s: an Evaluation of Alternative Explanations", *American Economic Review*, 82, 371-391.

[8] Caselli, F. (1999), "Technological Revolutions", *American Economic Review*, 87, 78-102.

[9] Deaton , A. and J. Muellbauer (1980), "An Almost Ideal demand System", *American Economic Review*, 70, 312-326.

[10] Di Nardo, J. , Fortin, N. and T. Lemieux (1996), "Labour Market Institutions and the Distribution of Wages: 1973-1992", *Econometrica,* 64, 1001-1044.

[11] Juhn, C., K. Murphy and B. Pierce (1993), "Wage Inequality and the Rise in Returns to Skills", *Journal of Political Economy*, 101, 410-442.

[12] Katz, L. and K. Murphy (1992), "Changes in Relative Wages: Supply and Demand Factors", *Quarterly Journal of Economics,* 107, 35-78.

[13] Kiley, M. (1999), "The Supply of Skilled Labor and Skill-Biased Technical Progress", *The Economic Journal*, 109, 708-724.

[14] Krueger, A. (1997), "Labor Market Shifts and the Price Puzzle Revisited", NBER WP 5924.

[15] Krusell, P., L. Ohanian, V. Rios-Rull and G. Violante (2000), "Capital Skill Complementarity and Inequality", *Econometrica,* 68, 1029-1053.

[16] Lee, D. (1999), "Wage Inequality in the US during the 80s: Rising Dispersion of Falling Minimum Wage?", *Quarterly Journal of Economics,* 114, 941-1024.

[17] Machin, S. (1999), "Wage Inequality in the 70s, 80s and 90s", in "The State of Working Britain", Manchester University Press.

[18] Machin, S. and J. van Reenen (1998), "Technology and Changes in the Skill Structure: Evidence from Seven OECD Countries", *Quarterly Journal of Economics*, 113, 1215-1244.

[19] Sachs, J. and H. Shatz (1994), "Trade and Jobs in US Manufacturing", *Brookings Papers on Economic Activity,* 1, 1-84.

[20] Wood, A. (1994), "North-South Trade, Employment and Inequality: Changing Fortunes in a Skill Driven World", Oxford, Clarendon Press.

Table 3: The consumption item-industry match

Consumption Item	Industry name and code	Skill intensity
Hairdressing	9820 hairdressing	0.006
Fish	4150 fish processing	0.013
Footwear	4510 footwear	0.015
Laundry	9811 laundry	0.015
Cleaning services	9230 cleaning services	0.016
Bread and biscuit	4196 bread and biscuit	0.017
Take away	6612 take away	0.018
Meat	4123 meat production	0.023
Men outerwear	4532 mens' outerwear	0.023
Postage	7901 post services	0.026
Sweets	4213 ice cream, chocolate	0.030
Bus fares	7210 road passenger transport	0.031
Furniture	4671 wood furniture	0.032
Toys	4942 toys	0.034
Domestic electric appliances	3460 domestic electric appliances	0.036
Milk products	4130 preparation of milk	0.042
Rail fares	7100 railways	0.042
Fruit and vegetables	4147 fruit and vegetables	0.042
House furnishing	4555 soft furnishing	0.053
Soft drinks	4283 soft drinks	0.056
Spirits	4240 spirit distilling	0.061
Tobacco	4290 tobacco	0.061
Records	3452 records	0.062
Cereals	4160 grain milling	0.063
Phone	7902 telecommunications	0.068
Sugar	4200 sugar	0.070
Wine	4261 wine	0.073
Beer	4270 brewing	0.078
Books	4751 printing and publishing	0.093
Gas bill	1620 gas supply	0.093
Nhs payments	9510 hospitals	0.099
Other fares	7500 air transport	0.106

Table 3: continued

Consumption Item	Industry name and code	Skill intensity
Electricity bill	1610 electricity distribution	0.112
Contributions to pension	8150 other financial	0.114
Insurance premium	8200 insurance	0.116
Computers	3301 data processing equipment	0.117
Bank charges	8140 banking	0.119
Soap and toilet products	2581 soap and toilet	0.132
Drugs	2570 pharmaceuticals	0.217
Petrol	1300 mineral oil extraction	0.219
Entertainment	9770 recreational services	0.242
Subscriptions to trade unions	9631 trade unions associations	0.246
TV licence	9741 radio &TV	0.255
Legal fees	8350 legal services	0.329
Medical fees	9530 medical practices	0.336
Education	9310 education	0.533

Table 4: The means of the data

	Full Sample		Lowest 20th		Highest 20th	
	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.
Number of families	79492		15903		15903	
Age of head	50.2		61.2		44.5	
Years of education of head	9.9		8.5		11.6	
Number of persons	2.4		1.4		3.1	
Number of children under 18	0.6		0.2		0.7	
Number of retired	0.3		0.7		0.1	
Income after tax	206.9	(177.2)	62.6	(16.2)	441.1	(257.9)
Average Expenditure	162.6	(185.3)	58.2	(53.7)	311.0	(315.6)
Food	0.21	(0.11)	0.29	(0.12)	0.14	(0.07)
Cater	0.05	(0.05)	0.03	(0.05)	0.06	(0.05)
Alcohol	0.05	(0.06)	0.03	(0.07)	0.05	(0.05)
Tobacco	0.03	(0.05)	0.04	(0.07)	0.01	(0.03)
Fuel	0.08	(0.07)	0.15	(0.10)	0.04	(0.03)
Household Goods	0.08	(0.09)	0.07	(0.09)	0.08	(0.10)
Household Services	0.05	(0.05)	0.07	(0.06)	0.05	(0.05)
Clothing	0.06	(0.08)	0.04	(0.08)	0.08	(0.08)
Personal Goods and services	0.04	(0.05)	0.04	(0.05)	0.05	(0.05)
Fares	0.02	(0.05)	0.02	(0.04)	0.02	(0.05)
Leisure Goods	0.05	(0.06)	0.04	(0.05)	0.05	(0.06)
Leisure services	0.05	(0.06)	0.05	(0.06)	0.05	(0.07)
Other services	0.05	(0.07)	0.03	(0.05)	0.08	(0.09)

Table 5: Almost Ideal System Estimates. Income Elasticities

Consumption Item	Coefficient	Std. Error	Expenditure share	Elasticity
Hairdressing	0.000	(0.000)	0.010	1.08
Fish	-0.003	(0.000)	0.009	0.63
Footwear	0.005	(0.000)	0.015	1.32
Laundry	-0.000	(0.000)	0.000	0.59
Cleaning services	0.000	(0.000)	0.000	1.44
Bread and biscuit	-0.009	(0.001)	0.013	0.29
Take away	0.005	(0.000)	0.061	1.08
Meat	-0.004	(0.000)	0.012	0.63
Men outerwear	0.009	(0.000)	0.013	1.71
Postage	-0.000	(0.000)	0.003	0.87
Sweets	-0.001	(0.000)	0.008	0.75
Bus fares	0.007	(0.000)	0.028	1.24
Furniture	0.020	(0.002)	0.016	2.21
Toys	0.006	(0.000)	0.011	1.53
Domestic electric appliances	0.012	(0.000)	0.013	1.93
Milk products	-0.012	(0.001)	0.017	0.30
Rail fares	0.001	(0.000)	0.007	1.21
Fruit and vegetables	-0.005	(0.000)	0.016	0.66
House furnishing	0.013	(0.000)	0.014	1.90
Soft drinks	-0.002	(0.000)	0.008	0.65
Spirits	0.005	(0.000)	0.013	1.40
Tobacco	-0.020	(0.001)	0.037	0.44
Records	0.001	(0.000)	0.006	1.26
Cereals	-0.004	(0.000)	0.007	0.42
Phone	-0.013	(0.001)	0.034	0.60
Sugar	-0.003	(0.000)	0.004	0.27
Wine	0.005	(0.000)	0.009	1.52
Beer	-0.005	(0.000)	0.035	0.84
Books	-0.007	(0.000)	0.024	0.70
Gas bill	-0.021	(0.003)	0.037	0.43
Nhs payments	0.001	(0.000)	0.002	1.77
Other fares	0.010	(0.000)	0.012	1.88

Table 5: continued

Consumption Item	Coefficient	Std. Error	Expenditure share	Elasticity
Electricity bill	-0.034	(0.001)	0.049	0.30
Contributions to pension	0.018	(0.003)	0.012	2.44
Insurance premium	0.000	(0.000)	0.020	1.02
Computers	0.002	(0.002)	0.000	3.59
Bank charges	-0.000	(0.000)	0.001	0.96
Soap and toilet products	-0.000	(0.000)	0.015	0.93
Drugs	-0.000	(0.000)	0.007	0.98
Petrol	-0.001	(0.000)	0.005	0.78
Entertainment	0.028	(0.000)	0.038	1.74
Subscriptions to trade unions	0.006	(0.000)	0.019	1.31
TV licence	-0.013	(0.000)	0.019	0.31
Legal fees	0.001	(0.000)	0.000	3.93
Medical fees	0.005	(0.001)	0.003	2.46
Education	0.010	(0.001)	0.008	2.26

Table 6: Match Input-Output table to industry classification

OECD Input Output	Industry name and code
Community social and personal services	9820 hairdressing
Food Beverages Tobacco	4150 fish processing
Textiles	4510 footwear
Community social and personal services	9811 laundry
Community social and personal services	9230 cleaning services
Food Beverages Tobacco	4196 bread and biscuit
Restaurants and Hotels	6612 take away
Food Beverages Tobacco	4123 meat production
Textiles	4532 men outerwear
Government consumption	7901 post services
Food Beverages Tobacco	4213 ice cream, chocolate
Transport and Storage	7210 road passenger transport
Wood Products	4671 wood furniture
Rubber and plastic products	4942 toys
Electric apparatus	3460 domestic electric appliances
Food Beverages Tobacco	4130 preparation of milk
Transport and storage	7100 railways
Food Beverages Tobacco	4147 fruit and vegetables
Textiles	4555 soft furnishing
Food Beverages Tobacco	4283 soft drinks
Food Beverages Tobacco	4240 spirit distilling
Food Beverages Tobacco	4290 tobacco
Rubber and plastic products	3452 records
Food Beverages Tobacco	4160 grain milling
Communication	7902 telecommunications
Food Beverages Tobacco	4200 sugar
Food Beverages Tobacco	4261 wine
Food Beverages Tobacco	4270 brewing
Paper and printing	4751 printing and publishing
Electricity gas and water	1620 gas supply
Government consumption	9510 hospitals
Transport and storage	7500 air transport

Table 6: continued

OECD Input Output	Industry name and code
Electricity gas and water	1610 electricity distribution
Finance and insurance	8150 other financial
Finance and insurance	8200 insurance
Office and computing machinery	3301 data processing equipment
Finance and insurance	8140 banking
Industrial chemicals	2581 soap and toilet
Drug and medicines	2570 pharmaceuticals
Petroleum and coal	1300 mineral oil extraction
Community social and personal services	9770 recreational services
Community social and personal services	9631 trade unions associations
Community social and personal services	9741 radio &TV
Real estate and business services	8350 legal services
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