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Abstract

In this study, we estimated the global living wage gap as $US674 billion per year, which is comparable to the GDP of Switzerland. India, the largest living wage gap country, contributed 32% of the global living wage gap. For a pair of jeans, closing the gap increased low-skilled cotton and textile wages in India by 137% and 52%, respectively, while the retail price only increased by 8% if consumed in Western countries. However, we found that most of the outputs with large living wage gaps from low-income countries are consumed domestically, suggesting that (1) closing the gap significantly increases the domestic price of products such as agriculture and textiles in low-income countries; and that (2) living wage premiums in high-income countries alone have a limited impact on closing the global living wage gap. The results highlights the need for both ethical trade and domestic living wage initiatives.

Keywords: Living wage, fair trade, ethical trade, social price formation, social value, globalisation, poverty reduction, Anker's Method, Corporate Social Responsibility, Multi Regional Input Output Analysis, Leontief price model, supply chain management, Indian jeans

JEL classification: J880 Labour Standards: Public Policy; J380 Wages, Compensation and Labour Costs; Public Policy; D63 Equity, Justice, Inequality and Other Normative Criteria; F1 Trade; L3 Non Profit Organisations and Public Enterprise; D57 Input-Output Tables and Analysis

1. Introduction

Keynes argued that protective measures are required to ensure that prices support nutrition and living standards for producers, and consumers are not entitled to expect that prices should fall below these standards (Keynes 1974, 1980). The recent introduction of living wages to a range of ethical trading standards (ETI 2015, 2016; FLO 2014, 2015; ISEAL 2013) conforms with Keynes' idea of protective measures.

The concept of a living wage has a long history and has been operationalised in industrialised countries over the past century in minimum wage campaigns (Anker 2011; Figart 2004; Stabile 2008) and more broadly by the International Labour Organization (ILO) and the United Nations (UN) to support the rights of workers (Anker 2011). The living wage also caps the number of working hours (Anker 2011) but does not capture all ethical considerations for labour in global production chains. Instead, living wages is a measure of absolute poverty (Anker 2006a), which provides an indicator for broader concepts of well-being (UN 2005). Absolute poverty is also the most common measure in national statistics and favoured where hunger and the inability to meet basic needs is more pronounced (UN 2005).

Although the concept of living wages is increasingly widely recognized, to our best knowledge, the magnitude of the living wage gap has not been quantified at the global level. Furthermore, the change in the prices of goods and services to close the gap has not been reported in the literature. Addressing this research gap has two challenges, (1) quantify the living wage gap at a global level, and (2) calculating the ripple effect of costs throughout the supply chain. Calculating the living wage gap requires defining a standard for the living wage and calculating the difference to current wages. Calculating the effect throughout the supply chain requires modelling of direct and indirect economic relationships such as the living wage gap in the inputs to a production process as well as between the intermediaries that lie between the producer and consumer.

Our research contributes to a number of ongoing discussions in the literature including indirect economic relationships in the fair trade movement (Jaffee 2014; Luetchford 2014), the monitoring of compliance to ethical labour standards (ETI 2015; Gourevitch 2011; Gualandris et al. 2015; Werner and Lim 2015; Wilhelm et al. 2016) as well as the modelling of labour in global supply chains (Alsamawi et al. 2014a; Alsamawi et al. 2014b; Gomez-Paredes et al. 2015; ILO 2016).

2. Method

The method applied in this research sought to estimate the living wage gap, which is the difference between the current and living wage, and the implications of closing it on the prices to be borne by the downstream supply chain and final consumers. First, we present an economy-wide analysis using a multi-regional input-output (MRIO) model to understand the price change implications of living wage payments and to calculate the global living wage gap. Second, we illustrate the price changes for closing the living wage gap at the product scale by considering jeans produced in India and sold in the US.

2.1 Living wage determination

The living wage is defined in this study as the "hourly wage rate required to support a household at the poverty line" (Anker 2006a, p. 312). The living wage is a political concept which draws upon values such as decency, fairness and the importance of families and may change by location and time (Anker 2011). Anker (2011) reviewed living wage methodologies and has developed a manual to provide a consistent approach to quantifying the living wage (‘Anker’s Method’) (Anker and Anker 2017). Anker’s Method has been adopted by the Global Living Wage Coalition (GLWC) which encompasses a number of organisations that focus on labelling of ethical trade (ISEAL 2013). The GLWC developed a set of living wage benchmarks based on Anker’s Method (Khalid 2015). However, the number of GLWC benchmarks is limited and additional living wage estimates are required to model the living wage gap in global supply chains. Therefore, additional estimates are developed based on the relationship of the living wage to the basic costs, which define absolute poverty (Anker 2006b).

Quantifying absolute poverty for the measurement of living wage needs to address the (1) referencing and (2) identification problems (World Bank 2015, p. 37). The referencing problem is the challenge of defining the adequate minimum level of well-being at which an individual is not considered poor in the specific local context. The identification problem is the challenge of defining the level of income to meet the minimum level of well-being (World Bank 2015).

In this analysis, the identification problem is addressed by drawing on the relationship of the food share and median income to the living wage. The relationship between the food share of a household budget and the poverty line is known as Engel’s Law. Data for household food budgets is coupled together with food shares by income class to estimate the poverty line (Anker 2006b). The income is then expressed as a living wage using Anker’s Method. In addition, the living wage was also estimated based on the relationship of the median income to the living wage line by income class (Anker 2006a). The income class is defined using the World Bank 2011 classification of country by income groups, namely low, lower-middle, upper-middle and high-income countries (World Bank 1989, 2016). The Supplementary Material provides a summary of each step of the calculation, assumed food shares and ratios as well as the application of Anker’s Method.

2.2 Data used for living wage calculation

The food costs applied in this research are based upon data from the Living Wage Map (LWM) (WI 2016). The LWM collects local food prices, and combines these with national food consumption patterns from the Food and Agriculture Organisation (Guzi and Kahanec 2014). The calorie requirement is set to 2100 kcal/day following the World Bank proposal of nutritional requirements for good health (Guzi and Kahanec 2014). The World Bank proposal can be viewed as a minimum; the average calorie intakes for Africa and the world in 2009 were 2600 and 2800 kcal/day, respectively (Guzi and Kahanec 2014). The LWM considers the nutritional requirements of the food basket using the balanced diet by the World Health Organisation (WHO) (Guzi and Kahanec 2014). Such a consideration is critical for lower-income countries because national food consumption patterns may reflect the lack of income to buy nutritional food, despite the calorie count (Anker and Anker 2017; Guzi and Kahanec 2014).

The LWM local food prices, the use of national food consumption patterns and the adjustment for nutritional requirements is similar to Anker's 'practical optimisation approach' for a model living wage diet (Anker and Anker 2017, p. 50). Differences include detailed considerations of calorie requirements based on age, sex, body size and physical activity for a typical family. However, the LWM calorie intake of 2100 kcal/day is modified for children following the default recommendation of 1895 kcal/day for children with moderate activity in Anker's Method (Anker and Anker 2017). Besides, Anker's Method requires in-situ collection of food prices from locations where workers shop for food (Anker and Anker 2017), while the LWM uses an on-line Cost of Living Survey, although available comparisons suggest only a small difference to prices collected in-situ (Kabina 2015).

Food and non-food costs for the living wage were estimated using the median income as estimated by the Organisation for Economic Co-operationa and Development (OECD) (OECD 2016). For countries not covered by the OECD data, median incomes were derived from the World Bank's 'Povcal' database (Diofasi and Birdsall 2016). The ratio of median income to living wage estimates was calculated by World Bank income class using existing living wage estimates which included Anker (2006a) and estimates from the GLWC for Brazil (de Freitas Barbosa et al. 2016) and India (Mamkoottam and Kaicker 2016). For the countries and income classes not covered by these data sources, we calculated the living wage following the food share approach. The Supplementary Material lists the data used for Anker's Method as well as financial assumptions for inflation, exchange rates and income tax rates.

2.3 Skill level and income

The Mincerian Earnings Function defines the return on education (Soderbom et al. 2015). The function has a convex relationship between income and education for many developing countries (Soderbom et al. 2015) and remains convex up to about 15 years of education and concave after that point (Trostel et al. 2002). This suggests that a convex relationship between earnings and education is a reasonable assumption for low to medium skilled workers in developing countries, which is the focus of the living wage gap calculation in this paper.

The earnings function can be applied to a subset of an economy such as industry or product scales by specifying the skill mix at that level of disaggregation. For example, if the mix of skill levels in an industry is the same as the broader economy, then the percentage change in income to meet a livings wage gap will be the same in both scales based on the earnings function. In other words, the homogeneity of skills rather than homogeneity of economic outputs provides a basis for applying the earnings function to a subset of the economy. This relationship is used to apply the results from an industry-by-industry input-output model to data for a particular product.

2.4 Selection of a global Multi Regional Input-Output Model

The main criteria for the selection of the global Multi Regional Input-Output (MRIO) model was the availability of data to support the calculation of the living wage gap in global supply chains, namely income and working hours by skill level. We used the 2013 release of the World Input Output Database (WIOD) (Dietzenbacher et al. 2013), because the detailed Socio Economic Accounts (SEA) provides both pieces of information. The GTAP (Global Trade Analysis Project) model, in contrast, considers only two skill levels and assumes a flat 40 hour/week for the calculation of hourly wage rates (Walmsley and Carrico 2013). WIOD defines three skill levels low, medium and high (Timmers 2012) based on the classification of educational attainment in the International Standard Classification of Education (ISCE) (UNESCO 1996). Details of the correspondence of WIOD skill levels and ISCE educational attainment is provided in the Supplementary Material. WIOD reports income and working hours by skill level which also enables the living wage gap to be calculated by skill level.

However, the selection of the MRIO model based on data availability introduces a number of limitations; WIOD limits the classification of the economy to 35 industries and uses an industry-by-industry table format. In comparison, other models such as Eora retain the detail in the original input-output tables including the use of industry-product tables which can contain up to 500 products in some economies (Manfred Lenzen et al. 2013; Tukker and Dietzenbacher 2013). The use of industry-by-industry format also means that price variations for the living wage gap are modelled for a mixed bundle of goods and services produced by an industry. Industry-by-commodity tables address the issue of secondary products and are the preferable basis for price models (Rueda-Cantuche 2011). However, existing industry-by-product MRIOs do not have sufficiently detailed SEA to calculate a living wage gap using working hours and labour income by skill level. In addition, the product classification for an industry-by-product table is often too coarse, and analyzing a detailed product category often requires additional data and models (Suh et al. 2004).

Another important limitation of WIOD, and MRIO models in general, is the coverage of low-income countries. Low-income countries have a large informal sector which lacks official governance and is not captured in national accounts (Guha-Kasnobis et al. 2006) (ILO 2013). For example, WIOD contains country specific data for 29 high, 9 upper-middle, 2 lower-middle (India and Indonesia) and no low-income countries. In comparison, the World Bank classification of 215 countries includes 36 low, 54 lower-middle, 54 upper-middle and 71 high-income countries.

In this analysis, countries not represented in WIOD are aggregated into the Rest of World (RoW) region, for which SEA data is not available. Erumbun et al. (2012) documents the approach for each country included in the WIOD. The under representation of low-income countries is not a large limitation in terms of capturing global production and trade because the RoW only represents 15% of world production (Timmers 2012). However, the under representation of low-income countries limits the application of the MRIO method in regions where payments to close the living wage gap are most needed.

2.6 The living wage gap

The following equations provide a summary of the calculation procedure for the living wage gap. Equation (1) is a summary of Anker's Method for calculating the living wage and detailed calculations for each term is provided in the Supplementary Material.

$$l_j^{gross} = c_j^{basic\ needs} \div f_j + t_j \qquad (1)$$

Equation (1) calculates the gross living wage of industry j, l_j^{gross} as a function of the cost of basic needs for a family, $c_j^{basic\ needs}$ divided by the number of full-time equivalent workers per family, f_j and adjusted for tax and statutory deductions, t_j .

Equations (2-8) calculate the living wage gap by comparing l_j^{gross} to current wages in WIOD. The subscriptes are reserved for variable dimensions where *i, j,* and *s* refer to industry classification, region and skill level, respectively. In the application using WIOD, the region distinguishes country-level details, and the skill level distinguishes low, medium and high levels of skill. The superscript % denotes the percentage share of each skill level, *s*.

$$h_{i,j,s} = \frac{h^{\%}_{i,j,s}}{100} h_{i,j} \quad (2)$$

$$w_{i,j,s} = \frac{w^{\%}_{i,j,s}}{100} w_{i,j} \quad (3)$$

Equatons (2) and (3) calculate the hours worked, *h,* and the wages, *w*, by skill levels. By dividing hours worked by wages, an hourly wage rate by skill level is derived (equation (4).

$$w^{rate}_{i,j,s} = \frac{w_{i,j,s}}{h_{i,j,s}} \quad (4)$$

Equation (5) calculates the annual wage based on the ILO convention for the maximum working hours per week (ILO 1919), which follows Anker's Method for addressing excessive work hours (Anker 2011; Bhattacharjee and Roy 2012; ETI 2015; FLO 2014, 2015; Guzi and Kahanec 2014).

$$w^{ILO}_{i,j,s} = (48 \times 52) w^{rate}_{i,j,s} \quad (5)$$

Equation (6) calculates the living wage gap (LWG), $\Delta v^{LWG}_{i,j,s}$, subject to the conditions in equation (7). The global living wage gap (GLWG), Δv^{GLWG} is simply the sum of the living wage gaps across all skills, industries and regions, equation (8).

$$\Delta v^{LWG}_{i,j,s} = l^{gross}_{j} - w^{ILO}_{i,j,s} \quad (6)$$

$$\Delta v^{LWG}_{i,j,s} = \begin{cases} 0 & if\ w^{ILO}_{i,j,s} \geq l_j \\ l^{gross}_{j} - w^{ILO}_{i,j,s} & if\ w^{ILO}_{i,j,s} < l_j \end{cases} \quad (7)$$

$$\Delta v^{GLWG} = \sum^{i,j,s} \Delta v^{LWG}_{i,j,s} \quad (8)$$

Finally, the living wage gap is derived as a percentage change of existing wages, $\Delta w^{\%}_{i,j,s}$ in equation (9).

$$\Delta w^{\%}_{i,j,s} = \frac{\Delta v^{LWG}_{i,j,s}}{w_{i,j,s}} . 100 \quad (9)$$

2.5 Price Model

Input-Output models describe the interactions among industries and consumers through production and consumption of goods and services, the use of production factors, and creation and distribution of value added. The Leontief price model, a dual of Leontief quantity model, determines the price as a function of value-added by sector (v) and the input-output structure of an economy (A) which is expressed in equation (9) using matrix mathematics,

$$p = (I - A')^{-1}v \qquad (10)$$

where p is price by industry, A is the direct input coefficient and prime (') transposes a matrix or a vector (Miller and Blair 2009). From equation (10), the change in price due to a change in value-added under the same input-output structure can be derived:

$$\Delta p = (I - A')^{-1}\Delta v. \qquad (11)$$

Dietzenbacher (1997) showed that Ghosh's allocative model (Ghosh, 1958) can be interpreted as a cost push model that is analogous to the Leontief price model. In this framework, the effect on price is expressed in direct and indirect interactions among industries and the changes in value-added. This mechanism of cost transfer toward the downstream supply chain is explained using the cost push model.

First, the increase in value-added (e.g., wage or profit) of production causes a increase in the price of the good or service produced – referred to as the direct contribution to price. Second, the increased price is passed downstream to suppliers that use the good or service as an input for their own production, referred to as the indirect contribution to price. This cost push propagates down the supply chain until it reaches the end consumer, forming a new price structure for the commodities based on changes in value added in production.

This approach assumes that the changes in price in downstream supply chain follow the changes in value added and do not affect the volume of consumption. In other words, consumption is inelastic to price, and there is no price-driven substitution among products. The framework provides an indication of the price that consumers should pay for the existing consumption basket under the current supply chain structure when living wage gaps are closed. It does not consider consumer responses to price shocks.

The resulting price increases needed for closing the living wage gap should be interpreted as the living wages that are not paid across the supply chain, which is an attributional and static concept, rather than the price increases when living wages are paid, which is a causal and dynamic concept (Cucurachi and Suh 2017; Suh and Yang 2014).

2.7 Identifying the major contributors in the supply chain

Structural Path Analysis (SPA) (Defourny and Thorbecke 1984; Lenzen 2003; Treloar 1997) is used to identify supply chains paths that have a large contribution to the change in price. SPA quantifies the contribution of a single transaction (or a supply path) to the total cumulative metric acrued throughout the supply chain. In this study, SPA quantifies the contribution of living way payment by a supply path in the total increase in price to be eventually paid by an end consumer. The SPA also provides insight to data collection for the case study. The Matlab code used for the SPA calculations is provided in the Supplementary Material.

2.7 Method used for the case study of jeans

The case study focuses on jeans produced in India and sold in high-income countries or Western countries (Europe and the US) and draws upon existing studies (Miller 2009; Miller and Williams 2009; Miller 2013). The wage costs to produce jeans in India were increased by the percentage change for industry wages to close the living wage gap. The product price model was then used to recalculate prices along the supply chain, including agents fees and taxes which are levied as a percentage of the new prices.

The data for the product supply chain focuses on the value added and the contribution to price rather than the technical details of production. For example, the supply chain simply starts with the fabric price which contains the value added for agricultural processes. The remaining stages include cut and make, trim, agent's commission, duty, freight, clearance and inland freight, private label markup, less mark down charge-back and retail mark-up which result in the full retail price (the consumer purchasers' price). Miller (2009) calculates the price of the product by adding the value added of each production process to the price of its inputs along the supply chain. The price of the inputs captures indirect and direct interactions. However, following the Leontief price model, a change in value added will change the price of the inputs based on the technical coefficients – equation (9). This means that a change in value added to meet the living wage gap will require consideration of industry interactions.

The first step of the method for generalizing the case-study is to express the supply chain data as a flow matrix, X^{jean}, value added account, v^{jean}, final demand and total input and output. The second stage of the case study method applies the MRIO changes in value added for a living wage of an industry sector to the production processes in the case study. This assumes that the production process is typical of the broader industry, such as the Indian production of jeans is assumed to be typical the broader Indian textile industry. The WIOD industry shares of labour and capital as well as wages by skill level are then used to disaggregate the value added reported by Miller (2009).

The percentage change in wages to close the living wage gap, $\Delta w_{i,j,s}^{\%}$, was then applied to wages, $w_{k,i,j,s}$, for process k, to calculate the living wage gap for the jeans, $\Delta v_{k,i,j,s}^{jean\ LWG}$ as outlined in equation (12). The change in price for the jeans, $\Delta p_{k,i,j,s}^{jean\ LWG}$, as a result of $\Delta v_{k,i,j,s}^{jean\ LWG}$ is then calculated using the Leontief price model as outlined in equation (13). Taxes, transport and retail were included and the prices expressed as purchasers' price. The example is also used to demonstrate the basic matrix calculations for the price model and each step is provided in the Supplementary Material.

$$\Delta v_{k,i,j,s}^{jean\ LWG} = \frac{\Delta w_{i,j,s}^{\%}}{100} w_{k,i,j,s} \quad (12)$$

$$\Delta p_{k,i,j,s}^{jean\ LWG} = \left(I - A'^{jean}\right)^{-1} \Delta v_{k,i,j,s}^{jean\ LWG} \quad (13)$$

The calculation procedure does not consider all aspects of value that may affect the social formation of price. It is also important to stress that the ethical position focuses on measuring how much a consumer *should* pay to ensure living wages throughout the supply chain rather than market values and modelling of prices for how much a consumer is *willing* to pay.

3. Results

3.1 Economy-wide analysis results

3.1.1 Percentage change in basic prices

Figure 1 presents 36 industry-country pairs which have a price increase of more than 5%. All prices in this section are basic prices and do not include margins such as transport and taxes. While the largest percentage price change is about 78% for private households in Mexico, the price change reduces rapidly across the list to 5% for 'Wholesale Trade and Commission Trade' in Turkey (TUR). The price change continues to diminish for the remaining industry-country pairs and only

102 of the 1435 industry-country pairs have a meaningful price change (greater than 1%) (see the Supplementary Material).

This suggests that provision of living wages has a small effect on price change at a global level for most industries. The largest price changes are concentrated in a relatively small number of countries and industries. Two thirds of the industry country pairs in Figure 1 belong to three countries, namely Brazil, India and Indonesia. Over two thirds of the industry-country pairs in Figure 1 belong to 8 industries, namely private households, agriculture, 'Food, beverages and tobacco' (food), 'Hotels and Restaurants', 'Wood and products of wood' (wood), 'Other Community, Social and Personal Services', 'Leather, leather and footwear' (footwear) and textiles. As compared to the 8% increase in the end consumer price of Indian jeans previously calculated under the case study, the economy-wide analysis came up with a slightly higher price increase of 11% for Indian textile industry. The textile industry in Brazil also had a similar price increase of 13%.

Figure 1. Percentage change in basic prices to close the living wage gap by direct and indirect components of the supply chain.

Figure 1 also presents the price change in terms of the direct and indirect economic interactions. The direct price change refers to the living wage gap within an industry. The indirect price change refers the living wage gap in industries in the supply chain. For example, the textile industry has a direct price change from the living wage gap within the textile industry. It also has an indirect price change from the living wage gap in the agriculture industry that supplies cotton to the textile industry. Indirect price changes are an important consideration for labelling of products for meeting living wage requirements. Some industries in Figure 1 have a price change greater than 5% but do not have a living wage gap within the industry as shown in Figure 2. As a result, a product label for living wages needs to consider both direct and indirect economic interactions to communicate living wage compliance to the consumer. Indirect price changes are important for industries such as textiles, footwear and any industry that draws heavily upon agriculture such as food and wood.

Direct price changes are important for industries that have relatively small inputs from other sectors of the economy. For example, the direct price change was important for industries such as agriculture and ranged between 83% for Russia and 91% for Indonesia of the price change reported in Figure 1. The direct price change was also important in most countries for private households and accounted for 100% of the price change reported in Figure 1. An exception was India where the direct price change was 95% due to its industry classification which includes household-based businesses.

3.1.2 Living Wage Gap by Skill Level and Industry

Figure 2 presents the living wage gap per capita by skill level. In general, the living wage gap reflects the skill level as well as the cost of living in each country. Low skilled labour has the greatest living wage gap in most countries. High skilled labour has a living wage gap in only a fraction of the industries presented.

Interestingly, the living wage gap in absolute value is largest in high-income countries such as Canada (CAN) and lowest in lower-middle-income countries such as India (IND). This is in part a consequence of using U.S. dollar in market exchange rate of the year rather than using purchasing power disparity (PPP)-adjusted prices. The high living wage gap for 'Private Households with Employed Persons' (private households) in Canada is partly a function of the exchange rate in 2011. Applying 2017 Canadian exchange rates reduce the living wage gap by about $10 000/person/year. The financial conversions follow Anker's Method for updates of living wage estimates which focus on the effect of high inflation within a country rather than exchange rates for expressing the results in US dollars (Anker and Anker 2017).

Figure 2. Per-capita living wage gap by skill level

The significance of the living gap can also be gauged from the perspective of the industry living wage gap – the size of the living wage gap for a whole industry-country pair – as shown in Figure 3. The industry living wage gap is particularly large for 'Agriculture, Hunting, Forestry and Fishing' (agriculture) in India and Brazil (BRA). This contrasts with the relatively small per capita living wage gap in agriculture in India. From this perspective, the per capita living wage gap reflects the very large number of people in agriculture in India and Brazil that have a living wage gap. Figure 3 also shows the contribution of each industry-country pair to the Global Living Wage Gap (GLWG). The GLWG is the sum of living wage gaps for all industry-country pairs in the global economy. The GLWG is an order of magnitude estimate to convey the size of the living wage gap in the global economy and its distribution by country and skill level. The GLWG wage gap was estimated to be $674 billion USD per year, which is comparable to the Gross Domestic Product of Switzerland (World Bank 2017).

The countries with the largest living wage gaps are India, Brazil and China which account for 32%, 28% and 18% of the global living wage gap. These proportions also reflect the main industry living wage gaps in Figure 3 – such as Agriculture in India which represents 28.5% of the global living wage gap. In fact, the industry country pairs in Figure 3 capture 92% of the global living wage gap. Low skill workers account for 69% of the GLWG, medium skill 28% and high skill about 3%.

Figure 3. Industry living wage gap by skill level

3.1.3 Domestic and Export Supply

Figure 4 presents the share of industry output that goes to the domestic economy or for trade. This indicates the degree to which the living wage gap can be addressed through trade. Agricultural products are the focus of existing FLO labelling. Figure 2 shows that most of the agricultural output is consumed domestically. The share of agricultural exports are 1%, 4%, 4%, 5%, 11%, 16% for Japan (JPN), Indonesia (IDN), Russia (RUS), India (IND), Mexico (MEX) and Brazil (BRA) respectively. As a result, the cost for closing the living wage gap in agriculture will be borne largely by the domestic consumers in each country. Alternatively, the living wage gap in agriculture could be met by consumers in high-income countries. For example, Brazil has a relatively large share of agriculture that is exported and could potentially cover the living wage gap for all of Brazillian agriculture. However, this would require a relatively large increase in the export price because the living wage cost would become more than six times greater i.e. 16% of the consumption needs to cover 100% of the living wage cost.

New FLO standards have also recently been developed for textiles which require living wages to be implemented within the next 6 years (FLO 2016b). Industries such as textiles and footwear in countries such as India have a relatively large fraction of exports (21%) and suggests an important focus for the new FLO standards. Some industries also have a large share of exports despite the apparent local focus of the services, such as 'Hotels and restaurants' and 'Private households with employed persons'. This is a function of the broad industry categories in the input-output model where employment, such as employees of a household, are directly engaged in production which is then exported.

Figure 4. Share of industry output to the domestic economy and trade

3.1.4 Important Supply Chain Paths for Living Wage Costs in Indian Textiles

The living wage gap in agriculture had over two and half times the effect on the price of texiles than the living wage gap within the texile industry itself. This illustrated that agriculture is an important focus for closing the living wage gap for Indian textile products. Conversely, only considering the textile production stage would address only about 28% of the living wage gap for the whole supply chain for an Indian textile product. The Supplementary Material provides a detailed analysis of the supply chain paths that create this effect within the economy.

Figure 5. The relative contribution to textile prices from the living wage gap in agriculture and the living wage gap within the the textile industry itself

3.2 Case study: jeans produced in India

Figure 6 presents the supply chain costs to produce a pair of jeans in India for retail in Western countries based upon Miller (2009). The percentage change in price from living wages along the supply chain is also shown.

In summary, closing the living wage gap has a large effect when the price is small in the early stage of the supply chain and a small effect at the end of the supply chain when the price is elevated as values are added along the supply chain. The increase in wages to close the living wage gap for Indian agriculture was 137%, 90% and 31% for low, medium and high skilled labour, respectively. This resulted in a 65% increase in the price for cotton. Further wage increases of 52% for low and 10% for medium skilled labour in Indian textile sector resulted in a 32% increase in the Free on Board price (the price to deliver to the buyer and cleared for export) of textiles. However, brand and retail markups in Western countries are relatively large, so that living wage costs in the early stage of the supply chain only contribute about 8% to the final retail price. This is an additional cost of about $3, which increases the price from $36.71 to $39.75.

This results suggests that the price increase to close the living wage gap in low-income countries is relatively small from a Western consumer point of view, confirming the common belief that closing the living wage gap doesn't cost much.

Figure 5. The effect on prices along the supply chain for closing the living wage gap for jeans produced in India and sold in Western countries

4. Discussion

Ethical trade provides a mechanism for addressing the living wage gap by transferring payments from consumers back to producers. The discussion considers the application of the results to existing ethical trade initiatives as well as limitations and future research needs.

Ethical trade organisations, such as the FLO, pay producers an additional amount, known as a premium, for meeting ethical trade standards. Our results can support FLO decision-making for setting premiums that cover living wage requirement in new FLO standards (FLO 2014, 2015). The results suggest that current premiums will need to increase significantly to close the living wage gap in traded products. For example, the Fairtrade premium for high profile products such as coffee and chocolate is 15% and 10% of the floor price (FLO 2016a). The current premium for cotton seed is 5% of the 'ex-works' price (delivered to the buyer but not cleared for export) (FLO 2016a). In comparison, the results suggest that closing the living wage gap will increase agricultural prices up to 6%, 22%, 41% and 56% for Russia, Indonesia, Brazil and India respectively. This finding suggests that the current premium for cotton would cover much of the living wage gap in Russia but would need to increase by an order of magnitude to close the living wage gap in Indian agriculture. This also suggests that the way premiums are set will need to reflect the living gap in each country. The FLO currently sets the same premium for all countries based on a percentage of the global price.

The results also highlight the need for clear labelling of the extent that living wages are addressed through out the supply chain. For example, FLO standards for textiles allow a label of compliance to be given for only part of the supply chain, such as a label for living wages in cut and sewing operationgs for textiles (FLO 2016b). However, cotton production has a much large living wage gap cut and sewing operations in countries such as India. This suggests that a label for cut and sewing operations would need to inform the consumer that most of the living wage gap for the product has not been addressed. This is particularly important for consumer decision-making based on the social value of ethical products and to maintain confidence in labels.

The results also can support consumer decision-making for ethical products by quantifying the change in price for closing the living wage gap. The case study results suggest that cost of closing the living wage gap is relatively small for consumers in high-income countries. The price for jeans produced in India increased by about $3 for a high-income consumer to pay for living wages throughout the supply chain. Without an awareness of the potential costs for ethical production, a consumer may be under the impressions that increases in purchasers prices will be greater than their willingness to pay. Conversely, a consumer may unrealistically demand retail prices lower than the costs to meet ethical standards. From the perspective of the textile industry, it is generally accepted that living wage costs would have a small effect on retail prices (Miller 2009). Defining the labour costs may also change buying practices in the textile industry to increase the compliance with living wages standards in the supply chain (Miller 2013). However, the fast pace of the fashion industry and the complexity of buyer and supplier interactions would required detailed and current data for costs (Miller 2013).

However, the scope of ethical trade to address the global living wage gap is limited in two ways. Firstly, much of the global living wage gap is contained in production that is consumed within a country. For example, India only exports about 5% of agricultural output. This suggests that the living wage gap for 95% of Indian agriculture needs to be addressed domestically. Secondly, ethical trade is only a small fraction of the volume of goods that are exported. For example, leading FLO products include coffee, tea, bananas, cocoa, and sugar represent only about 0.9%, 0.3%, 0.3%, 0.25% and 0.003% of global production in 2007/2008 (Auld 2014). The living wage gap calculated for Indian agriculture is approximately 8.4% of Indian GDP in 2011 (World Bank 2017). While this is a significant proportion of the Indian economy, it compares to the average annual GDP growth rate of 7.6% in India over the past decade (World Bank 2017), which suggests the potential for India to address its living wage gap in Agriculture over time. There is also the potential for fair trade organisations to exert a greater influence in countries that have a larger export share and living wage gap. This potential is exemplified by Brazil which has a relatively large export share for agriculture of 16% as well as a large industry living wage gap. Brazil also suggests the potential to consider fair trade for industries other than agriculture. For example, the Brazillian footwear industry has a living wage gap as well as an export share of 25%.

The living wage provides a quantitative indicator for a broader definition of well-being. The living wage can be complemented with other approaches such as an issues based analysis of compliance to ILO guidelines in the global economy (Gomez-Paredes et al. 2015). Broader consideration of well-being also highlights challenges for implementing living wage in lower-income countries. For example, addressing the living wage gap for agriculture in lower-income countries may cause increases in food prices and also exacerbate poverty in other sectors of the economy. In this context, broader social policy such as the ILO Social Protection Floor (SPF) (ILO 2011, 2012, 2015) may be more appropriate.

The modelling approach also has a number of data and methodological limitations. The lack of detailed living wage estimates based on Anker's Method was addressed using estimates based on the relation of food shares and the median wage to absolute poverty. This provides estimates that are an average of +/-30% of estimates based on Anker's Method. However, the results may be an underestimate because the detailed living wage estimate based on Anker's Method was generally greater than the estimates based on food shares and median income. The living wage estiamtes were considered suitable for modelling living wages in global trade but can lead to large errors for individual countries. In addition, living wages can vary within a country between rural and urban settings (Anker and Anker 2017) as well as for different family types (Anker 2006b; Ciscel 2004). There is also a data gap for low-income countries which relates to the large informal sector of the economy (Guha-Kasnobis et al. 2006; ILO 2013). For example, approximately 92% of employment was in the informal economy in India in 2012 and most of these workers had low earnings and limited or no social protection (IHD 2014). These limitations are reflected in the MRIO structure and can be addressed using modelling techniques that draw upon context specific data – known as hybrid methods (Suh *et al.*, 2004). The Structural Path Analysis (SPA) provides guidance to focus the data collection on areas that have the largest effect on the results. The hybrid approach can accommodate detailed data such as from Ankers Method as well as capture the indirect economic interactions which have been identified as a challenge for ethical trade intiatives (Jaffee 2014).

5. Conclusions

We calculated a first-cut estimates of the living wage gap in the global economy as $US674 billion per year. This amount is comparable to the GDP of the world's 19th economy, Switzerland. Among the countries that our data could distinguish, India was the largest contributor, being responsible for about 32% of the global living wage gap.

Our results showed that closing the living wage gap in low-income countries for products such as textiles has a small effect on the retail price when sold in Western countries, confirming the common belief. However, we also found that export is only a small fraction of the global production with large living wage gaps, and much of the living wage gap is outside of the reach of ethical trade. This suggests the importance of measures to address absolute poverty within each country.

Our analysis of price requirements showed that closing the living wage gap in low-income countries may require large price increases for domestic consumers of low-income countries. In particular, agriculture in low-income countries such as Indian and Brazil had large living wage gaps which can lead to large price increases for domestic consumers and presents challenges for implementation.

The large living wage gap for agriculture in low-income countries also suggests that large increases will be required for premiums paid by ethical trade organisations to producers. The living wage gap in agriculture also flows through to other products such as textiles. In this case, the living wage gap was actually greater from agricultural inputs than within the textile industry itself. This is particularly important for new textile standards where components of the supply chain, such as the fabrication stage within the textile industry, can be labelled as complying with living wage standards.

Our research highlights the needs of domestic policy to address living wage gaps in addition to ethical trade initiatives. Our results suggest that the two approaches need to be implemented in tandem in order to close the global living wage gaps. Further research is suggested to include more low-income countries in global economic models and to refine estimates of the living wage gap within each country.

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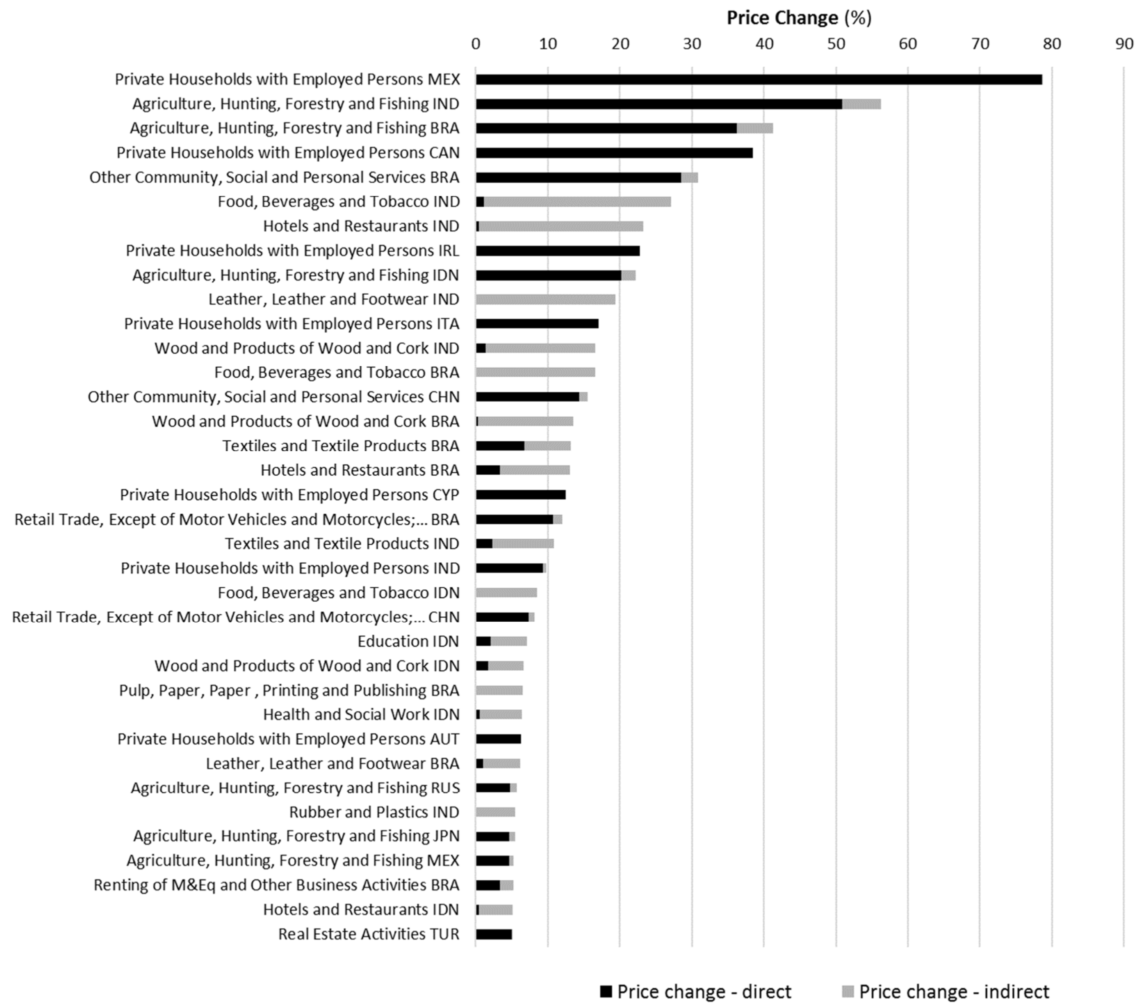
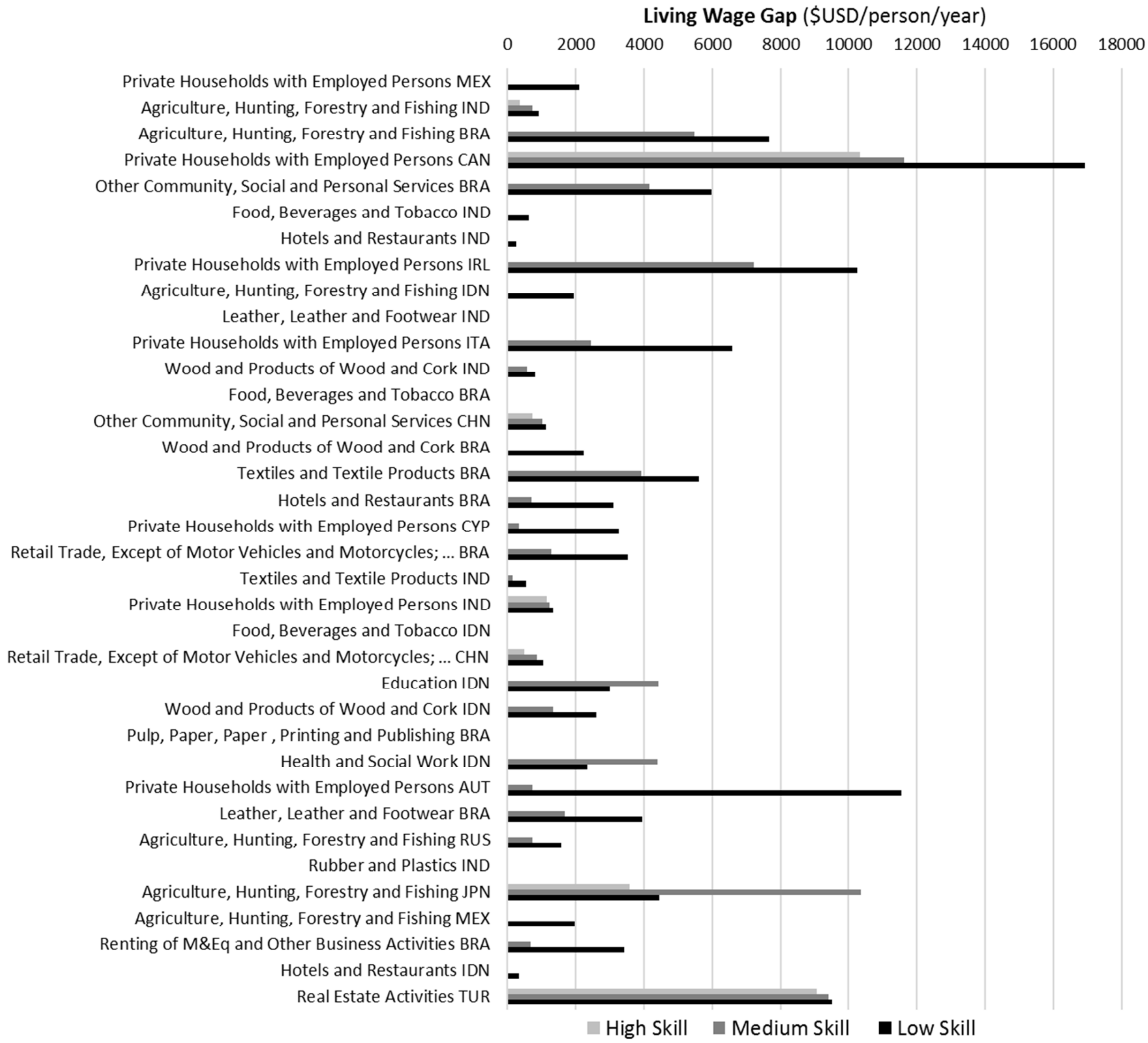
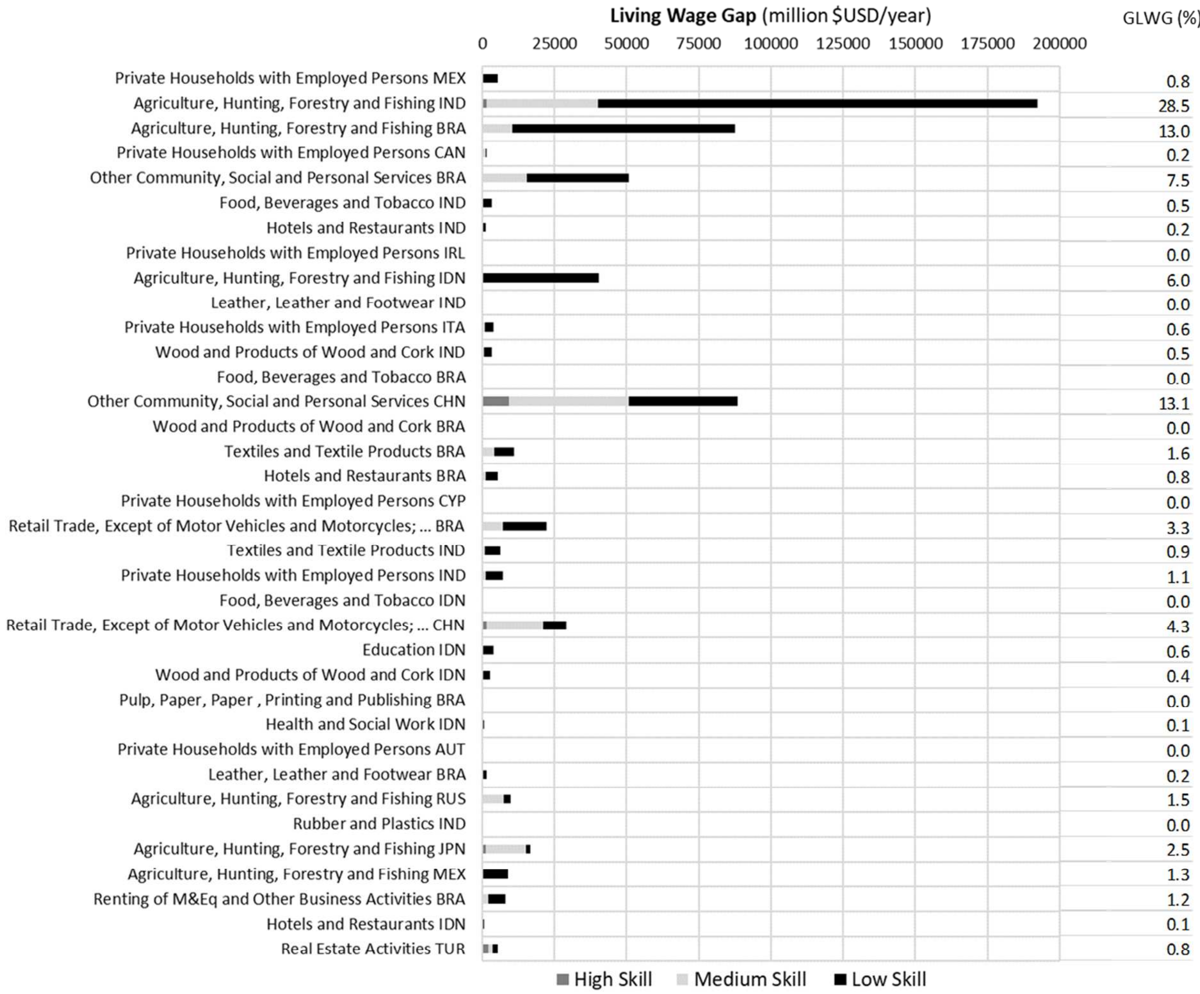
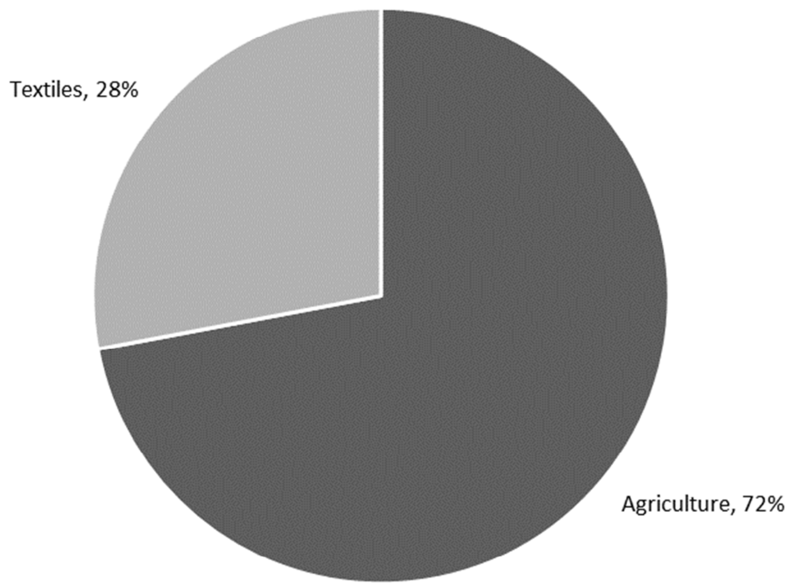
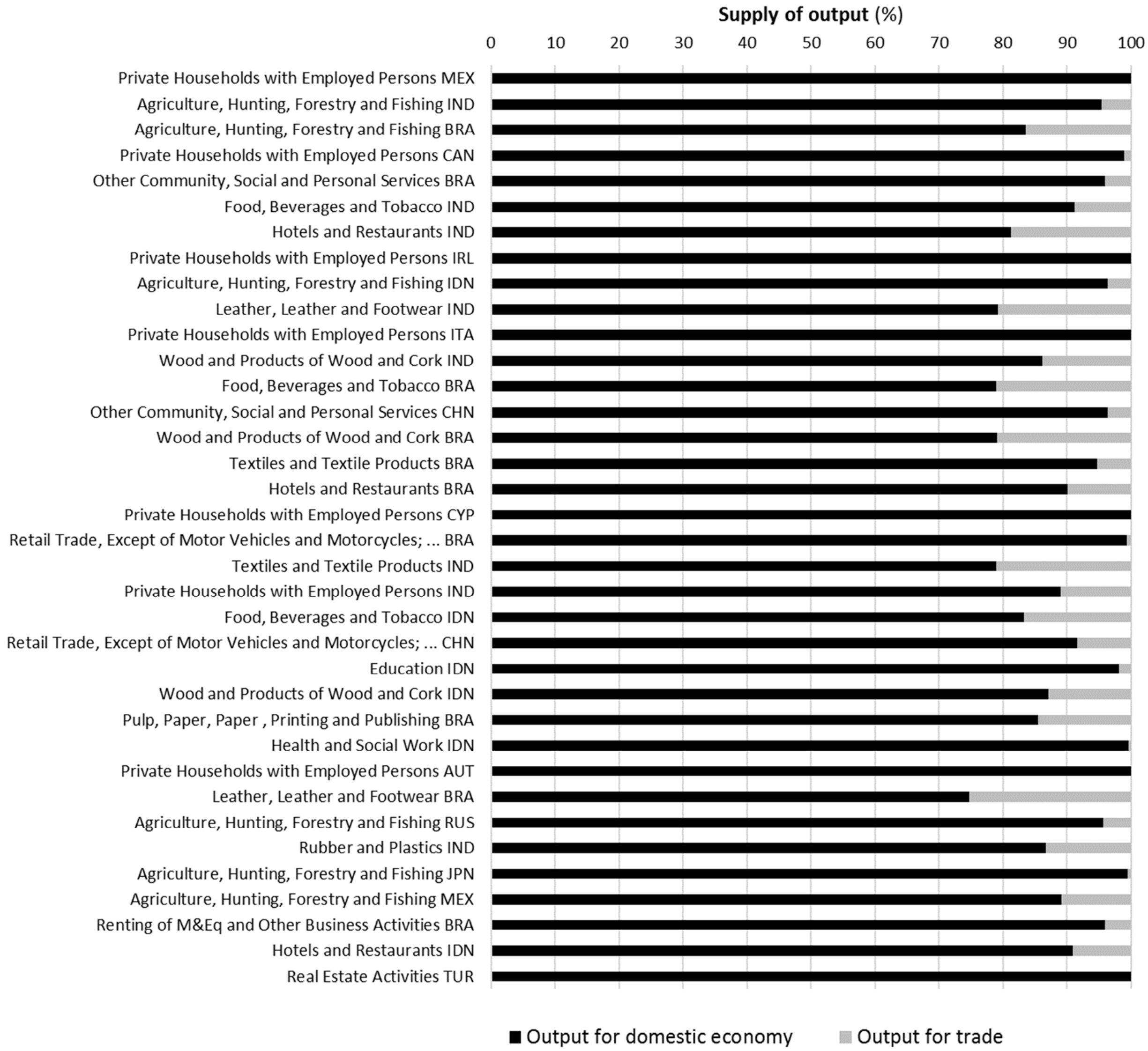
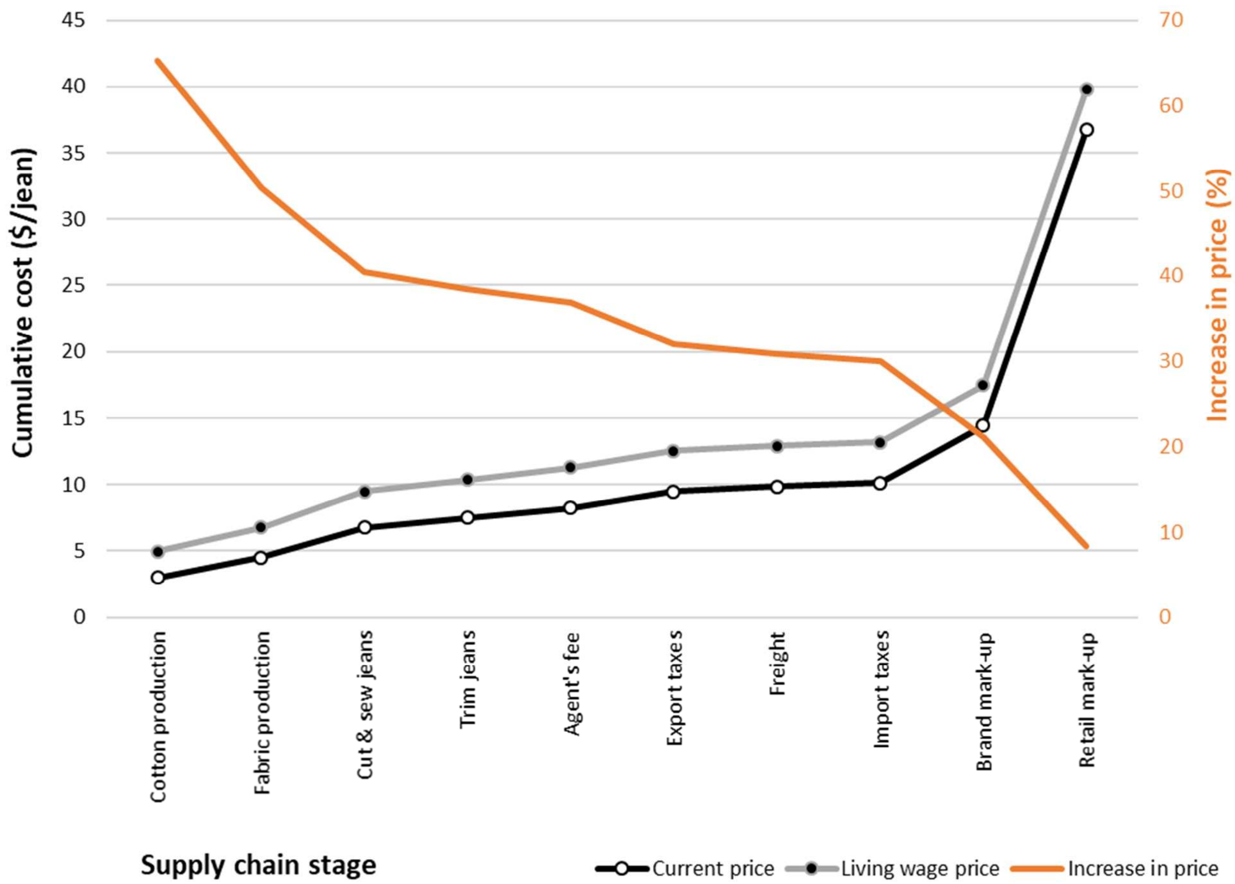

Price Change (%)
0
10
20
30
40
50
60
70
80
90
Private Households with Employed Persons MEX
Agriculture, Hunting, Forestry and Fishing IND
Agriculture, Hunting, Forestry and Fishing BRA
Private Households with Employed Persons CAN
Other Community, Social and Personal Services BRA
Food, Beverages and Tobacco IND
Hotels and Restaurants IND
Private Households with Employed Persons IRL
Agriculture, Hunting, Forestry and Fishing IDN
Leather, Leather and Footwear IND
Private Households with Employed Persons ITA
Wood and Products of Wood and Cork IND
Food, Beverages and Tobacco BRA
Other Community, Social and Personal Services CHN
Wood and Products of Wood and Cork BRA
Textiles and Textile Products BRA
Hotels and Restaurants BRA
Private Households with Employed Persons CYP
Retail Trade, Except of Motor Vehicles and Motorcycles;... BRA
Textiles and Textile Products IND
Private Households with Employed Persons IND
Food, Beverages and Tobacco IDN
Retail Trade, Except of Motor Vehicles and Motorcycles;... CHN
Education IDN
Wood and Products of Wood and Cork IDN
Pulp, Paper, Paper , Printing and Publishing BRA
Health and Social Work IDN
Private Households with Employed Persons AUT
Leather, Leather and Footwear BRA
Agriculture, Hunting, Forestry and Fishing RUS
Rubber and Plastics IND
Agriculture, Hunting, Forestry and Fishing JPN
Agriculture, Hunting, Forestry and Fishing MEX
Renting of M&Eq and Other Business Activities BRA
Hotels and Restaurants IDN
Real Estate Activities TUR
Price change - direct
Price change - indirect

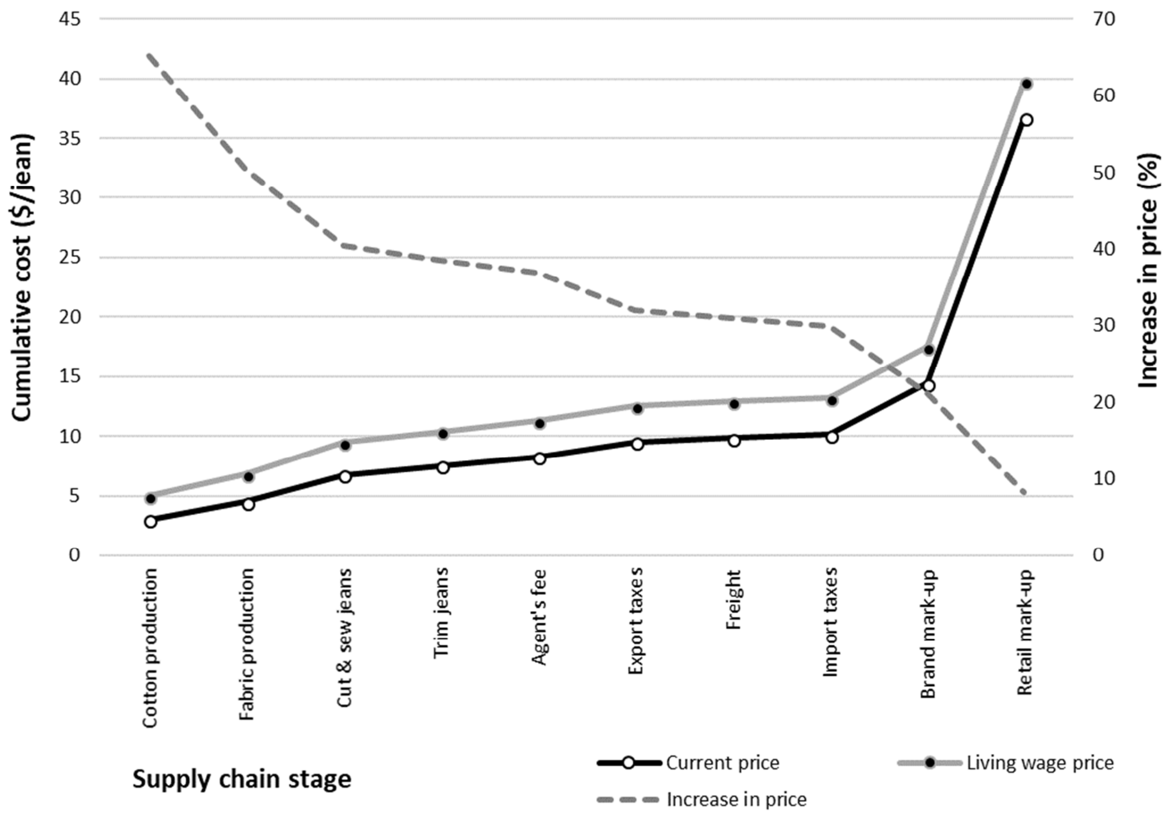

Living Wage Gap ($USD/person/year)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
Private Households with Employed Persons MEX
Agriculture, Hunting, Forestry and Fishing IND
Agriculture, Hunting, Forestry and Fishing BRA
Private Households with Employed Persons CAN
Other Community, Social and Personal Services BRA
Food, Beverages and Tobacco IND
Hotels and Restaurants IND
Private Households with Employed Persons IRL
Agriculture, Hunting, Forestry and Fishing IDN
Leather, Leather and Footwear IND
Private Households with Employed Persons ITA
Wood and Products of Wood and Cork IND
Food, Beverages and Tobacco BRA
Other Community, Social and Personal Services CHN
Wood and Products of Wood and Cork BRA
Textiles and Textile Products BRA
Hotels and Restaurants BRA
Private Households with Employed Persons CYP
Retail Trade, Except of Motor Vehicles and Motorcycles; ... BRA
Textiles and Textile Products IND
Private Households with Employed Persons IND
Food, Beverages and Tobacco IDN
Retail Trade, Except of Motor Vehicles and Motorcycles; ... CHN
Education IDN
Wood and Products of Wood and Cork IDN
Pulp, Paper, Paper , Printing and Publishing BRA
Health and Social Work IDN
Private Households with Employed Persons AUT
Leather, Leather and Footwear BRA
Agriculture, Hunting, Forestry and Fishing RUS
Rubber and Plastics IND
Agriculture, Hunting, Forestry and Fishing JPN
Agriculture, Hunting, Forestry and Fishing MEX
Renting of M&Eq and Other Business Activities BRA
Hotels and Restaurants IDN
Real Estate Activities TUR
High Skill
Medium Skill
Low Skill


Living Wage Gap (million $USD/year)
GLWG (%)
0 25000 50000 75000 100000 125000 150000 175000 200000
Private Households with Employed Persons MEX 0.8
Agriculture, Hunting, Forestry and Fishing IND 28.5
Agriculture, Hunting, Forestry and Fishing BRA 13.0
Private Households with Employed Persons CAN 0.2
Other Community, Social and Personal Services BRA 7.5
Food, Beverages and Tobacco IND 0.5
Hotels and Restaurants IND 0.2
Private Households with Employed Persons IRL 0.0
Agriculture, Hunting, Forestry and Fishing IDN 6.0
Leather, Leather and Footwear IND 0.0
Private Households with Employed Persons ITA 0.6
Wood and Products of Wood and Cork IND 0.5
Food, Beverages and Tobacco BRA 0.0
Other Community, Social and Personal Services CHN 13.1
Wood and Products of Wood and Cork BRA 0.0
Textiles and Textile Products BRA 1.6
Hotels and Restaurants BRA 0.8
Private Households with Employed Persons CYP 0.0
Retail Trade, Except of Motor Vehicles and Motorcycles; ... BRA 3.3
Textiles and Textile Products IND 0.9
Private Households with Employed Persons IND 1.1
Food, Beverages and Tobacco IDN 0.0
Retail Trade, Except of Motor Vehicles and Motorcycles; ... CHN 4.3
Education IDN 0.6
Wood and Products of Wood and Cork IDN 0.4
Pulp, Paper, Paper , Printing and Publishing BRA 0.0
Health and Social Work IDN 0.1
Private Households with Employed Persons AUT 0.0
Leather, Leather and Footwear BRA 0.2
Agriculture, Hunting, Forestry and Fishing RUS 1.5
Rubber and Plastics IND 0.0
Agriculture, Hunting, Forestry and Fishing JPN 2.5
Agriculture, Hunting, Forestry and Fishing MEX 1.3
Renting of M&Eq and Other Business Activities BRA 1.2
Hotels and Restaurants IDN 0.1
Real Estate Activities TUR 0.8
High Skill
Medium Skill
Low Skill


Textiles, 28%
Agriculture, 72%


Supply of output (%)
0 10 20 30 40 50 60 70 80 90 100
Private Households with Employed Persons MEX
Agriculture, Hunting, Forestry and Fishing IND
Agriculture, Hunting, Forestry and Fishing BRA
Private Households with Employed Persons CAN
Other Community, Social and Personal Services BRA
Food, Beverages and Tobacco IND
Hotels and Restaurants IND
Private Households with Employed Persons IRL
Agriculture, Hunting, Forestry and Fishing IDN
Leather, Leather and Footwear IND
Private Households with Employed Persons ITA
Wood and Products of Wood and Cork IND
Food, Beverages and Tobacco BRA
Other Community, Social and Personal Services CHN
Wood and Products of Wood and Cork BRA
Textiles and Textile Products BRA
Hotels and Restaurants BRA
Private Households with Employed Persons CYP
Retail Trade, Except of Motor Vehicles and Motorcycles; ... BRA
Textiles and Textile Products IND
Private Households with Employed Persons IND
Food, Beverages and Tobacco IDN
Retail Trade, Except of Motor Vehicles and Motorcycles; ... CHN
Education IDN
Wood and Products of Wood and Cork IDN
Pulp, Paper, Paper , Printing and Publishing BRA
Health and Social Work IDN
Private Households with Employed Persons AUT
Leather, Leather and Footwear BRA
Agriculture, Hunting, Forestry and Fishing RUS
Rubber and Plastics IND
Agriculture, Hunting, Forestry and Fishing JPN
Agriculture, Hunting, Forestry and Fishing MEX
Renting of M&Eq and Other Business Activities BRA
Hotels and Restaurants IDN
Real Estate Activities TUR
Output for domestic economy
Output for trade


Cumulative cost ($/jean)
Increase in price (%)
0
5
10
15
20
25
30
35
40
45
0
10
20
30
40
50
60
70
Cotton production
Fabric production
Cut & sew jeans
Trim jeans
Agent's fee
Export taxes
Freight
Import taxes
Brand mark-up
Retail mark-up
Supply chain stage
Current price
Living wage price
Increase in price


45
40
35
30
25
20
15
10
5
0
Cumulative cost ($/jean)
70
60
50
40
30
20
10
0
Increase in price (%)
Cotton production
Fabric production
Cut & sew jeans
Trim jeans
Agent's fee
Export taxes
Freight
Import taxes
Brand mark-up
Retail mark-up
Supply chain stage
Current price
Living wage price
Increase in price

How large is the global living wage gap and the price increase needed to close it? – Supplementary Material

Contents

Tables

1 WIOT Industry and Country Classifications

Supplementary Material Table 1. WIOT industry classification

WIOT Industry name
Agriculture, Hunting, Forestry and Fishing
Mining and Quarrying
Food, Beverages and Tobacco
Textiles and Textile Products
Leather, Leather and Footwear
Wood and Products of Wood and Cork
Pulp, Paper, Paper , Printing and Publishing
Coke, Refined Petroleum and Nuclear Fuel
Chemicals and Chemical Products
Rubber and Plastics
Other Non-Metallic Mineral
Basic Metals and Fabricated Metal
Machinery, Nec
Electrical and Optical Equipment
Transport Equipment
Manufacturing, Nec; Recycling
Electricity, Gas and Water Supply
Construction
Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel
Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles
Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods
Hotels and Restaurants
Inland Transport
Water Transport
Air Transport
Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies
Post and Telecommunications
Financial Intermediation
Real Estate Activities
Renting of M&Eq and Other Business Activities
Public Admin and Defence; Compulsory Social Security
Education
Health and Social Work
Other Community, Social and Personal Services
Private Households with Employed Persons

Supplementary Material Table 2. WIOT country classification and country code

Country Code	Country Name
AUS	Australia
AUT	Austria
BEL	Belgium
BGR	Bulgaria
BRA	Brazil
CAN	Canada
CHN	China
CYP	Cyprus
CZE	Czech Republic
DEU	Germany
DNK	Denmark
ESP	Spain
EST	Estonia
FIN	Finland
FRA	France
GBR	United Kingdom
GRC	Greece
HUN	Hungary
IDN	Indonesia
IND	India
IRL	Ireland
ITA	Italy
JPN	Japan
KOR	South Korea
LTU	Lithuania
LUX	Luxembourg
LVA	Latvia
MEX	Mexico
MLT	Malta
NLD	Netherlands
POL	Poland
PRT	Portugal
ROU	Romania
RUS	Russia
SVK	Slovak Republic
SVN	Slovenia
SWE	Sweden
TUR	Turkey
TWN	Taiwan
USA	United States

2 Correspondence of WIOD skill levels to ISCE

Correspondence of WIOD skill levels (Timmers 2012) with the International Standard Classification of Education (ISCE) (UNESCO 1996),

- WIOD ‘low skill’ corresponds to ISCE level 1 ‘Primary education or first stage of basic education’ and ISCE level 2 ‘Lower secondary or second stage of basic education’.
- WIOD ‘medium skill’ corresponds to ISCED level 3 ‘(Upper) secondary education’ and ISCED level 4 ‘Post-secondary non-tertiary education’
- WIOD ‘high skill’ corresponds to ISCED level 5 ‘First stage of tertiary education’ and ISCE level 6 ‘Second stage of tertiary education’.

3 Financial assumptions for data preparation

Financial data were inflated or deflated to 2011 prices to match the base year for WIOT 2011. Prices were then converted from local currency to US dollars to match WIOT 2011. The data sources and their use are summarised below.

- World Bank exchange rates and inflation were used (World Bank, http://data.worldbank.org/ Accessed 20 January 2016). International Monetary Fund IMF exchange rates and inflation were used for Taiwan (World Economic Outlook Database, www.imf.org Accessed 20 January 2016).
- OECD.Stat tax rates, Table I.6. All-in average personal income tax rates at average wage by family type, were used to convert living wage estimate from net to gross incomes. http://stats.oecd.org/Index.aspx?DataSetCode=TABLE_I6 Accessed 30 January 2016)

4 Living Wage Data

Supplementary Material Table 3 summarises the living wage data based on the work of Richard Anker. This includes studies which show the relationship of the living wage to food shares and the median wage as well are recent estimates based on Anker’s Method. The average percentage difference for estimates above as well as below the selected estimate in the study is shown as a summary at the bottom of the table.

Supplementary Material Table 3. Selected living wage estimates for WIOD countries based on the work of Richard Anker

	Living Wage Estimate based on a typical family (2011 $US/year)					Difference between living wage estimates (%)		
Country	Recent detailed living wage estimates based on Ankers Method 2017	Living wage estimates by Richard Anker in 2006	Living wage estimates in this study based on food shares	Living wage estimates in this study based on median income	Selected living wage in this study	Living wage based on food share compared to Ankers Method 2017	Living wage based on median income compared to Ankers Method 2017	Living wage based on median income compared to living wage based on the food share
Source	1.	2.	3.	4.				
AUS			33977	41139	33977			21
AUT			30025	30338	30025			1
BEL			22071	27873	22071			26
BGR			5163	5308	5163			3
BRA	10262		6017	8150	10262	-41	-21	35
CAN			41710	33343	41710			-20
CHN		1656		1733	1656		5	
CYP				12054	12054			
CZE			11493	10776	11493			-6
DEU				25320	25320			
DNK				37933	37933			
ESP			20497	19469	20497			-5
EST				8273	8273			
FIN			23155	31391	23155			36
FRA			27112	26799	27112			-1
GBR			16677	24441	16677			47
GRC			19629	12740	19629			-35
HUN			10897	6427	10897			-41
IDN			4408	1634	4408			-63
IND	1558	1115	1313	977	1558	-16	-37	-26
IRL				26561	26561			
ITA			25305	22151	25305			-12
JPN				27744	27744			
KOR				16309	16309			
LTU		5044		2425	5044		-52	
LUX				46235	46235			
LVA				12390	12390			
MEX			3823	4059	3823			6
MLT				15258	15258			
NLD			19666	27565	19666			40
POL			8486	7404	8486			-13

PRT			18087	11565	18087			-36
ROU			3753	3532	3753			-6
RUS			4292	8219	4292			91
SVK			10371	10176	10371			-2
SVN				17062	17062			
SWE			31378	33783	31378			8
TUR			9789	6963	9789			-29
TWN				9931	9931			
USA		27393	22207	27198	27393	-19	-1	22
					Average if above		5	28
					Count	0	1	12
					Average if below	-25	-28	-21
					Count	3	4	14

Source:

1. The Global Living Wage Coalition has produced a series of detailed living wage estimates based on Anker's Method. This includes an estimate for Brazil (de Freitas Barbosa et al. 2016) and for India (Mamkoottam and Kaicker 2016).

2. Richard Anker developed living wage estimate for a number of countries (R. Anker 2006a) which predates the development of the more detailed Ankers Method.

3. Living wages were estimated in this study for a range of WIOD countries as outlined in section *6.3 Estimation of food and non-food costs for a living wage using the food share by country income level*.

4. Living wages were estimated in this study for a range of WIOD countries as outlined in section *6.4 Estimation of food and non-food costs for a living wage using the median wage by country income level.*

5 Living wage estimates based on the work of Richard Anker compared to other sources

Supplementary Material Table 4 compares the selected living wage estimate in this study with alternative living wage estimates. The average percentage difference for the alternative estimates above as well as below the selected estimate in the study is shown as a summary at the bottom of the table. Note that the methods for the alternative estimates consider food and non-food costs for a family. However, the estimates were not modified to conform with Anker's Method.

Supplementary Material Table 4. Comparison of living wage estimates based on the work of Richard Anker with alternative sources

	Living Wage Estimate based on a typical family (2011 $US/year)				Difference between selected living wage estimate and living wage estimates from other sources (%)		
Country	Selected living wage in this study	Living Wage Map	Asian Floor Wage	MIT Living wage	Living Wage Map	Asian Floor Wage	MIT Living Wage
Source	SM Table 3.	1.	2.	3			
AUS	33977	28306			20		
AUT	30025	18458			63		
BEL	22071	17225			28		
BGR	5163	8071			-36		
BRA	10262	11842			-13		
CAN	41710	24574			70		
CHN	1656		4289			-61	
CYP	12054						
CZE	11493	9344			23		
DEU	25320						
DNK	37933						
ESP	20497	18373			12		
EST	8273						
FIN	23155	17514			32		
FRA	27112	20159			34		
GBR	16677	16274			2		
GRC	19629	12605			56		
HUN	10897	9138			19		
IDN	4408	5157	4087		-15	8	
IND	1558	3942	2743		-60	-43	
IRL	26561						
ITA	25305	19329			31		
JPN	27744						
KOR	16309						
LTU	5044						
LUX	46235						
LVA	12390						
MEX	3823	6684			-43		
MLT	15258						
NLD	19666	14936			32		
POL	8486	8866			-4		
PRT	18087	12348			46		
ROU	3753						
RUS	4292	6158			-30		
SVK	10371	9945			4		
SVN	17062						
SWE	31378	20743			51		
TUR	9789	11810			-17		

TWN	9931						
USA	27393	19994		26469	37		3.5
				Average if above	33	8	3
				Count	17	1	1
				Average if below	-27	-52	
				Count	8	2	

Source:

1 (Guzi and Kahanec 2014; WI 2016) median typical family living wage

2 (Bhattacharjee and Roy 2012; Merk 2009) standard family of 2 adults and 2 children

3 (Nadeau et al. 2014; Nadeau and Glasmeier 2016) average US living wage for standard family of 2 adults and 2 children

6 Cost of a basic but decent life for a family

Based on Anker's Method, the cost of a basic but decent life was defined as the sum of food, housing and other essential costs multiplied by a margin for unforeseen events (R. Anker and Anker 2017). The costs were estimated in this study based on the ratio of food to non-food costs and the ratio of the median wage to the living wage. A 5% margin for unforeseen events was applied to the food and non-food costs following the recommendation from Anker's Method (R. Anker and Anker 2017).

$$Cost\ of\ a\ basic\ but\ decent\ life\ for\ a\ reference\ family = (cost\ of\ food + cost\ of\ housing + cost\ of\ other\ essential\ needs) * margin\ for\ unforseen\ events \quad (1)$$

6.1 Estimation of the net living wage

The net living wage was defined as the after-tax income that is required to meet the costs for a basic but decent life for a reference family (R. Anker and Anker 2017).

$$Net\ living\ wage = \frac{Cost\ of\ a\ basic\ but\ decent\ life\ for\ a\ reference\ family}{Number\ of\ full\ time\ workers\ per\ family} \quad (2)$$

6.2 Estimation of the gross living wage

The gross living wage was defined as the net living wage plus statutory payroll deductions and taxes (R. Anker and Anker 2017). The gross living wage corresponds to labour compensation in input-output tables, which is the cash and in-kind payment from an employer to an employee and includes wages and salaries as well as employers' social contributions (Eurostat 2008). Tax rates for OECD countries for an average wage for a family with two children were used where possible. These tax rates were also expressed by World Bank income class to apply the tax rates to non-OECD countries. However, the OECD countries only include upper-middle and high income countries and there were no low or lower-middle income countries. R. Anker and Anker (2017) note that it is not always necessary to consider income tax for a living wage because the tax-free income threshold may be above a living wage in some countries. For example, the recent living wage estimate for India was below the tax free threshold (Mamkoottam and Kaicker 2016). A comprehensive but dated review of the tax free threshold shows it can vary significantly among lower income and lower-middle income countries and suggest the need for country specific data (Sicat and Virmani 1987, 1988). For example, the recent living wage estimate for Ethiopia reports deductions of 23% of gross income which includes 15% income tax and 6% for social security tax and 2% for union fees (Melese 2015). The latter were considered as statutory deductions which can include social security taxes, payroll deductions, pensions and insurance (R. Anker and Anker 2017).

$$Gross\ living\ wage = Net\ living\ wage + Statutory\ payroll\ deductions\ and\ taxes \quad (3)$$

Supplementary Material Table 5 Deductions as a percentage of net living wages by World Bank country income class

World Bank income class	Average deductions divided by net living wage estimate	Number of estimates	Comment
Low	2.9	3	Bangladesh (Khan et al. 2016) Kenya (R. Anker and Anker 2014a) Malawi (R. Anker and Anker 2014b) The estimate for Ethiopia (Melese 2015) was not included because it was considered an outlier.
Low Middle	4.0	3	Pakistan (Sayeed and Dawani 2015) India (Mamkoottam and Kaicker 2016) Vietnam (R. Anker and Anker 2017)
Upper Middle	10.1	7	China (R. Anker and Anker 2017) Brazil (de Freitas Barbosa et al. 2016) Dominican Republic (R. Anker and Anker 2013a) South Africa (R. Anker and Anker 2013b) Chile, Mexico and Turkey (OECD.Stat)

High	14.9	31	(OECDStat)

6.3 Estimation of food and non-food costs for a living wage using the food share by country income level

6.3.1 Relationship of food costs to the living wage

Food costs were used to estimate the living wage based upon Engels Law, which expresses the relationship of the share of food costs to non-food costs as a function of the level of income (R. Anker 2011). World Bank income classifications were used with food shares to calculate a living wage following (R. Anker 2006b). The share of food costs was then used to calculate the poverty line (Richard Anker 2006c). The poverty line was then expressed as a living wage by considering the family size, the full time equivalents per household and a 5% margin for unforeseen expenses (R. Anker and Anker 2017)

$$Poverty\ line = Food\ costs * \frac{100}{\%\ spent\ on\ food} \tag{4}$$

6.3.2 Estimation of food costs

The food costs were based upon data from the Living Wage Map (LWM). The LWM collects local food prices which it combines with national food consumption patterns from the Food and Agriculture Organisation (Guzi and Kahanec 2014). The calories requirement was set to 2100 kcal/day following the World Bank proposal of nutritional requirements for good health (Guzi and Kahanec 2014). The World Bank calorie proposal can be viewed as a minimum compared to the average calorie intakes of 2600 and 2800 kcal/day for Africa and the world in 2009 (Guzi and Kahanec 2014). The LWM checks the nutritional requirements of the food basket against the World Health Organisation (WHO) balanced diet (Guzi and Kahanec 2014). Checking the nutritional requirements is espescially important for poorer countries because national food consumption patterns may reflect the lack of income to buy nutritional food, despite the calorie count (R. Anker and Anker 2017; Guzi and Kahanec 2014). The collection of local food prices, the use of national food consumption patterns and the adjustment for nutritional requirements was similar to Anker's Method for the 'practical optimisation approach' to creating a model living wage diet (R. Anker and Anker 2017). Differences include detailed considerations of calorie requirements based on age, sex, body size and physical activity for a typical family. However, the LWM calorie intake of 2100 kcal/day was modified for children following Anker's Method which recommends a default value of 1895 kcal/day for children with moderate activity (R. Anker and Anker 2017). Other differences included the collection of price data for food. The LWM used a Cost of Living

Survey which includes FAO food items. Anker' Method requires detailed price checks using surveys which identify the venues where workers buy food (R. Anker and Anker 2017). Available checks of food prices for the LWM suggest only a small difference to the estimated food costs (Kabina 2015).

6.3.3 Estimation of the typical family size

The number of children in a typical family was calculated from the total fertility rate (TFR) adjusted for the infant mortality rate following Anker's Method (R. Anker and Anker 2017). The household size was capped to a minimum and maximum of 4 and 6 people following recommendations in Anker's Method (R. Anker and Anker 2017). World Bank fertility and infant mortality rates were used for each country (http://data.worldbank.org/).

$$Average\ number\ of\ surviving\ children = TFR * (1 - child\ mortality\ rate\ per\ 100\ births) \quad (5)$$

$$Typical\ household\ size = 2 + Average\ number\ of\ surviving\ children \quad (6)$$

$$Recommended\ typical\ household\ size = \begin{cases} 4\ if\ typical\ household\ size < 4 \\ 6\ if\ typical\ household\ size > 6 \end{cases} \quad (7)$$

The living wage gap was calculated at the national level and did not consider rural and urban differences or expressing the family size in half persons as recommended in Anker's Method (R. Anker and Anker 2017).

6.3.4 Estimation of the full-time equivalents per household

Full time equivalents per household was based on the Labour Force Participation Rate (LFPR), the unemployment rate and the part-time rate following Anker's Method (R. Anker and Anker 2017). Data from the International Labour Organisation (ILO) was used for the LFPR and unemployment rates (ILOStat, http://www.ilo.org/ilostat/) and part-time working rates were from the OECD (https://data.oecd.org/). R. Anker and Anker (2017) recommends using the age group of 25-59 for LFPR and unemployment rates. However, the age group of 25-54 was used because it corresponds to age groups reported by the ILO. The available data for male and female LFPR and part time rate were used to calculate average rates by World Bank income groups Supplementary Material Table 6, Supplementary Material Table 7, Supplementary Material Table 8. The OECD part-time data did not include low or lower-middle income countries and a rate of 5% was assumed following Anker's Method (R. Anker and Anker 2017) -p254. This data was used to fill data gaps for countries with the same income class.

$$Proportion\ of\ full\ time\ work\ per\ working\ age\ adult = Average\ adult\ LFPR * (1 - unemployment\ rate) * \left[1 - \left(\frac{part\ time\ employment\ rate}{2}\right)\right] \quad (8)$$

$$Number\ of\ full\ time\ equivalent\ workers\ per\ family = 1 + Proportion\ of\ full\ time\ work\ per\ working\ age\ adult \quad (9)$$

Supplementary Material Table 6 Male LFPR by World Bank country income class

World Bank income class	Average male LFPR (%)	Number in ILO sample
Low	94.6	5
Low Middle	91.7	13
Upper Middle	94.6	27
High	92.0	43

Supplementary Material Table 7 Female LFPR by World Bank country income class

World Bank income class	Average male LFPR (%)	Number in ILO sample
Low	81.8	5
Low Middle	59.1	13
Upper Middle	81.8	27
High	76.6	43

Supplementary Material Table 8 Part time rate by World Bank country income class

World Bank income class	Average part time rate (%)	Number in OECD data sample	Assumed part time rate based on Ankers Method (%)
Low	-	0	5
Low Middle	-	0	5
Upper Middle	10.9	13	
High	15.7	33	

6.4 Estimation of food and non-food costs for a living wage using the median wage by country income level

Food and non-food costs for the living wage were also estimated using the median income. Median incomes were based upon OECD median incomes (OECDStat, http://stats.oecd.org/) and median incomes derived from the World Bank Povcal database (Diofasi and Birdsall 2016). The ratio of median income to the living wage estimate was calculated by World Bank income class using living wage estimates and presented in Supplementary Table 9. Estimates of this ratio by R. Anker (2006b) are also provided for comparison. The ratios calculated in this paper appear to provide a clearer progression from low to high income class. However, the number of estimates for low income countries remains small. Interestingly, the income class has changed for some countries over the time between the two estimates. For example, India was classified as low income in Anker's study (R. Anker 2006b) but the income class changed to lower-middle income in 2007.

Supplementary Material Table 9 Ratio of median to the living wage by World Bank country income class

World Bank income class	Ratio of the median to the living wage estimate in this study	Number of estimates in this study	Anker (2006) ratio of the median to the living wage	Number of estimates in Anker (2006)
Low	0.25	6	0.51	3
Low Middle	0.53	15	0.76	5
Upper Middle	0.81	19	0.73	2
High	1.14	19	1.37	2
Total		59		12

7 Price equations for the Leontief price model

The description of the Leontief Price model starts from the first principles of accounting balance equations as outlined by Leontief (1986). The accounting balances clarify the exogenous and endogenous variables, the model assumptions and the use of matrix mathematics. As a summary, Leontief (1986) describes the balance equations for 'price in an open static input-output system' as follows,

> 'Prices are determined in an open input-output system from a set of equations which states that the price that each productive sector of the economy receives per unit of its output must equal the total outlays incurred in the course of its production'.

(Leontief 1986), p29

$$\begin{aligned} &(1-a_{11})p_1 \quad - a_{21}p_2 \; - \; \dots \quad &- \; a_{n1}p_n = v_1 \\ &- a_{12}p_1 \; + (1-a_{22})p_2 - \; \dots \quad &- \; a_{n2}p_n = v_2 \\ &\dots \qquad \dots \qquad \dots \quad &\dots \quad \dots \\ &a_{1n}p_1 \quad - a_{2n}p_2 \; - \; \dots \quad &(1-a_{nn})p_n = v_n \end{aligned} \tag{10}$$

The technical coefficients, a_{ij}, are defined by the amount of output from industry i to industry j, x_{ij} , per unit of the total output of industry j, x_j.

$$a_{ij} = \frac{x_{ij}}{x_j} \tag{11}$$

The set of technical coefficients gives the structural matrix of the economy (Leontief 1986) and when used in the above equations are output coefficients. For example, a_{21}, expresses the fraction of output from industry 2 that is used in industry 1. This fraction allocates the price of industry 2 price to industry 1, that is $a_{21}p_2$.

The above set of equations can be expressed using the following matrices (12) and summarised in (13). Note that p and v are column vectors. The above equations might suggest that p is a row vector but matrix multiplication means that it needs to be a column to reproduce the set of equations.

$$\left\{\begin{bmatrix} 1 & \dots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \dots & 1 \end{bmatrix} - \begin{bmatrix} a_{11} & \dots & a_{n1} \\ \vdots & \ddots & \vdots \\ a_{1n} & \dots & a_{nn} \end{bmatrix}\right\} . \begin{bmatrix} p_1 \\ \vdots \\ p_n \end{bmatrix} = \begin{bmatrix} v_1 \\ \vdots \\ v_n \end{bmatrix} \tag{12}$$

$$I = \begin{bmatrix} 1 & \dots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \dots & 1 \end{bmatrix} \; A' = \begin{bmatrix} a_{11} & \dots & a_{n1} \\ \vdots & \ddots & \vdots \\ a_{1n} & \dots & a_{nn} \end{bmatrix} \; p = \begin{bmatrix} p_1 \\ \vdots \\ p_n \end{bmatrix} \quad v = \begin{bmatrix} v_1 \\ \vdots \\ v_n \end{bmatrix}$$

$$(I - A') \, . p = v \tag{13}$$

Note that the summary of the balance equations leads to technical coefficients A' as calculated using equation (11). The price model technical coefficients were labelled as a transpose because by convention this matrix is defined for the demand-pull model. This convention was retained because most input-output tables are published in the demand pull format. The technical coefficients for price balance equations can also be obtained by simply taking the transpose of the *input* coefficients (or alternatively transposing the flow matrix – see (Miller and Blair 2009).

$$A = X.\hat{x}^{-1} \tag{14}$$

8 Structural Path Analysis for the top 31 Paths

The top 31 paths were selected based on have a contribution to the price change that was greater than 0.01%. The 31 paths capture 94% of the price change and enable a more detailed analysis of the changes in living wages in the economy that affect the basic price of Indian textiles. Supplementary Material Table 10 shows the industry section abbreviations used in the SPA in Supplementary Material Table 11.

Supplementary Material Table 10 Industry abbreviations used in the SPA

Industry	Abbreviation
Textiles and Textile Products IND	Textiles IND
Agriculture, Hunting, Forestry and Fishing IND	Agriculture IND
Food, Beverages and Tobacco IND	Food IND
Wood and Products of Wood and Cork IND	Wood IND
Chemicals and Chemical Products IND	Chemicals IND
Other Community, Social and Personal Services CHN	Services CHN
Manufacturing, Nec; Recycling IND	Manufacturing IND
Manufacturing, Nec; Recycling CHN	Manufacturing CHN
Private Households with Employed Persons IND	Household employees IND

Supplementary Material Table 11 Structural Path Analysis for the top 31 paths

	Production Stage						
Path	0 (direct)	1	2	3	4	5	Price change (%)
1	Textiles IND	Agriculture IND					47.1
2	Textiles IND						20.8
3	Textiles IND	Textiles IND	Agriculture IND				10.0
4	Textiles IND	Textiles IND					4.4
5	Textiles IND	Agriculture IND	Agriculture IND				4.3
6	Textiles IND	Textiles IND	Textiles IND	Agriculture IND			2.1
7	Textiles IND	Textiles IND	Textiles IND				0.9
8	Textiles IND	Textiles IND	Agriculture IND	Agriculture IND			0.9
9	Textiles IND	Food IND	Agriculture IND				0.688
10	Textiles IND	Textiles IND	Textiles IND	Textiles IND	Agriculture IND		0.450
11	Textiles IND	Agriculture IND	Agriculture IND	Agriculture IND			0.401
12	Textiles IND	Wood IND	Agriculture IND				0.378
13	Textiles IND	Textiles IND	Textiles IND	Textiles IND			0.199
14	Textiles IND	Textiles IND	Textiles IND	Agriculture IND	Agriculture IND		0.195
15	Textiles IND	Chemicals IND	Agriculture IND				0.157
16	Textiles IND	Textiles IND	Textiles IND	Textiles IND	Textiles IND	Agriculture IND	0.095
17	Textiles IND	Textiles IND	Agriculture IND	Agriculture IND	Agriculture IND		0.085
18	Textiles IND	Food IND	Agriculture IND	Agriculture IND			0.063
19	Textiles IND	Manufacturing CHN					0.044
20	Textiles IND	Textiles IND	Textiles IND	Textiles IND	Textiles IND		0.042
21	Textiles IND	Textiles IND	Textiles IND	Textiles IND	Agriculture IND	Agriculture IND	0.041
22	Textiles IND	Wood IND					0.040
23	Textiles IND	Agriculture IND	Agriculture IND	Agriculture IND	Agriculture IND		0.037
24	Textiles IND	Food IND					0.036
25	Textiles IND	Wood IND	Agriculture IND	Agriculture IND			0.035
26	Textiles IND	Household employees IND					0.033
27	Textiles IND	Manufacturing IND					0.019
28	Textiles IND	Textiles IND	Textiles IND	Agriculture IND	Agriculture IND	Agriculture IND	0.018
29	Textiles IND	Chemicals IND					0.018
30	Textiles IND	Chemicals IND	Agriculture IND	Agriculture IND			0.014
31	Textiles IND	Services CHN					0.013

9 Product scale method for the Indian jeans case study

The flow matrix provides the starting point for the price model and clarifies how the data for producing jeans in India was assigned to the variables. Jacob (1995) provides a description of linear functions and their expression as matrices as well as the use of matrix operations such as calculating the inverse in the following example. The matrices are presented with row and column labels to maintain the connection to the supply chain processes.

Supplementary Material Table 12. Matrix, *X (shown in grey) and vectors v, x, f and p*

	Cotton	Fabric	Cut & Make	Trim	Agent	Duty	Freight	Clearance	Private label mark-up	Retail mark-up	Final demand (f)	Total output (x)
Cotton		3.00										3.00
Fabric			4.50									4.50
Cut & Make				6.75								6.75
Trim					7.50							7.50
Agent						8.25						8.25
Duty							9.50					9.50
Freight								10.00				10.00
Clearance									10.15			10.15
Private label mark-up										14.43		14.43
Retail mark-up											36.71	36.71
Value added (v)												
Labour and capital	3.00	1.50	2.25	0.75	0.75		0.35		4.28	22.28		
Tax						1.25		0.15				
Total input (p)	3.00	4.50	6.75	7.50	8.25	9.50	9.85	10.15	14.43	36.71	36.71	

Supplementary Material Table 13. Matrix, *A*

	Cotton	Fabric	Cut & Make	Trim	Agent	Duty	Freight	Clearance	Private label mark-up	Retail mark-up
Cotton	0	1	0	0	0	0	0	0	0	0
Fabric	0	0	1	0	0	0	0	0	0	0
Cut & Make	0	0	0	1	0	0	0	0	0	0
Trim	0	0	0	0	1	0	0	0	0	0
Agent	0	0	0	0	0	1	0	0	0	0
Duty	0	0	0	0	0	0	1	0	0	0
Freight	0	0	0	0	0	0	0	1	0	0
Clearance	0	0	0	0	0	0	0	0	1	0
Private label mark-up	0	0	0	0	0	0	0	0	0	1
Retail mark-up	0	0	0	0	0	0	0	0	0	0

Supplementary Material Table 14. Matrix *A'*

	Cotton	Fabric	Cut & Make	Trim	Agent	Duty	Freight	Clearance	Private label mark-up	Retail mark-up
Cotton	0	0	0	0	0	0	0	0	0	0
Fabric	1	0	0	0	0	0	0	0	0	0
Cut & Make	0	1	0	0	0	0	0	0	0	0
Trim	0	0	1	0	0	0	0	0	0	0
Agent	0	0	0	1	0	0	0	0	0	0
Duty	0	0	0	0	1	0	0	0	0	0
Freight	0	0	0	0	0	1	0	0	0	0
Clearance	0	0	0	0	0	0	1	0	0	0
Private label mark-up	0	0	0	0	0	0	0	1	0	0
Retail mark-up	0	0	0	0	0	0	0	0	1	0

Supplementary Material Table 15. Matrix, I

	Cotton	Fabric	Cut & Make	Trim	Agent	Duty	Freight	Clearance	Private label mark-up	Retail mark-up
Cotton	1	0	0	0	0	0	0	0	0	0
Fabric	0	1	0	0	0	0	0	0	0	0
Cut & Make	0	0	1	0	0	0	0	0	0	0
Trim	0	0	0	1	0	0	0	0	0	0
Agent	0	0	0	0	1	0	0	0	0	0
Duty	0	0	0	0	0	1	0	0	0	0
Freight	0	0	0	0	0	0	1	0	0	0
Clearance	0	0	0	0	0	0	0	1	0	0
Private label mark-up	0	0	0	0	0	0	0	0	1	0
Retail mark-up	0	0	0	0	0	0	0	0	0	1

Supplementary Material Table 16. Matrix (I-A')

	Cotton	Fabric	Cut & Make	Trim	Agent	Duty	Freight	Clearance	Private label mark-up	Retail mark-up
Cotton	1	0	0	0	0	0	0	0	0	0
Fabric	-1	1	0	0	0	0	0	0	0	0
Cut & Make	0	-1	1	0	0	0	0	0	0	0
Trim	0	0	-1	1	0	0	0	0	0	0
Agent	0	0	0	-1	1	0	0	0	0	0
Duty	0	0	0	0	-1	1	0	0	0	0
Freight	0	0	0	0	0	-1	1	0	0	0
Clearance	0	0	0	0	0	0	-1	1	0	0
Private label mark-up	0	0	0	0	0	0	0	-1	1	0
Retail mark-up	0	0	0	0	0	0	0	0	-1	1

Supplementary Material Table 17. Matrix $(I-A')^{-1}$

	Cotton	Fabric	Cut & Make	Trim	Agent	Duty	Freight	Clearance	Private label mark-up	Retail mark-up
Cotton	1	0	0	0	0	0	0	0	0	0
Fabric	1	1	0	0	0	0	0	0	0	0
Cut & Make	1	1	1	0	0	0	0	0	0	0
Trim	1	1	1	1	0	0	0	0	0	0
Agent	1	1	1	1	1	0	0	0	0	0
Duty	1	1	1	1	1	1	0	0	0	0
Freight	1	1	1	1	1	1	1	0	0	0
Clearance	1	1	1	1	1	1	1	1	0	0
Private label mark-up	1	1	1	1	1	1	1	1	1	0
Retail mark-up	1	1	1	1	1	1	1	1	1	1

10 Living wage gap for Indian jeans

The case study processes were assigned to industry-country sectors of WIOD as outlined in **Supplementary Material Table 18**. The WIOD data applied includes the labour and capital shares, the skill shares and the living wage gap calculation from the Leontief price model. Duty and clearance were assumed to be taxes and there was no corresponding industry-country sector. The processes of Freight, Private label mark-up and Retail mark-up were assumed to be industry-country processes of the importing country.

Supplementary Material Table 18. Correspondence between jean case study processes and industry sectors from WIOD

Jean case study process	WIOD industry sector
Cotton	Agriculture, Hunting, Forestry and Fishing -IND
Fabric	Textiles and Textile Products – IND
Cut & Make	Textiles and Textile Products – IND
Trim	Textiles and Textile Products – IND
Agent	Textiles and Textile Products – IND
Duty	-
Freight	Other Water transport – GBR
Clearance	-
Private label mark-up	Wholesale trade and commission trade, except of motor vehicles and motorcycles – GBR
Retail mark-up	Retail trade, except of motor vehicles and motorcycles; repair of household goods – GBR

Supplementary Material Table 19. Calculation of the living wage gap for Indian jeans

	Agriculture, Hunting, Forestry and Fishing -IND	Textiles and Textile Products - IND	Textiles and Textile Products – IND	Textiles and Textile Products - IND	Textiles and Textile Products - IND	Other Water transport - GBR	Wholesale trade and commission trade, except of motor vehicles and motorcycles - GBR	Retail trade, except of motor vehicles and motorcycles; repair of household goods – GBR
WIOD factor shares								
Labour share of value add	0.54	0.73	0.73	0.73	0.73	0.84	0.76	0.763
Capital share of value add	0.46	0.27	0.27	0.27	0.27	0.16	0.24	0.237
Disaggregation of value added using WIOD factor shares								
Labour	1.62	1.09	1.64	0.55	0.55	0.29	3.27	17.00
Capital	1.38	0.41	0.61	0.20	0.20	0.06	1.01	5.28
WIOD labour compensation by skill shares								
Low	0.699	0.465	0.465	0.465	0.465	0.232	0.231	0.231
Medium	0.268	0.409	0.409	0.409	0.409	0.443	0.521	0.521
High	0.032	0.126	0.126	0.126	0.126	0.325	0.248	0.248
Disaggregation of labour by WIOD skill shares								
Low	1.132	0.508	0.763	0.254	0.254	0.068	0.754	3.927
Medium	0.434	0.447	0.671	0.224	0.224	0.13	1.701	8.857
High	0.052	0.138	0.207	0.069	0.069	0.096	0.81	4.216
Living wage gap as a % Δv from WIOD price model								
Low	137	52	52	52	52			
Medium	90	10	10	10	10			
High	31	0	0	0	0			
Living wage gap for jeans by skill level, Δv jean living wage								
Low	1.551	0.264	0.397	0.132	0.132			
Medium	0.391	0.045	0.067	0.022	0.022			
High	0.016	0	0	0	0			
Total living wage gap for jeans	1.958	0.309	0	0	0	0	0	0
New labour value (current labour plus living wage gap)	3.58	1.40	2.10	0.70	0.70	0.29	3.27	17.00

11 Matlab Code for Calculations

11.1 Leontief Price Model – living wages and price changes

```
% CONTENTS
% ----------------------------------------------------------------------
% 1. Transpose of both technical coefficients and the Leontief inverse
% 2. Price model and percentage changes in price for living wage payments
% 3. Direct and indirect contribution to value added


%{
The script is for the Leontief price model.
The equations for the balance of value as an accounting equation
are summarised by Leontief (1986). The use of price balance equations to
form the matrices makes it clear why the price model uses A_transpose and
L_transpose. Miller and Blair (2009)
provide details on how the same set of
equations can be generated by changing which terms are transposed and the
order of matrix multiplication (see note below).

The World Input Output Database (WIOD) was used for interindustry flows Z
which were used to calculate A, the technical coefficient matrix,
which was then transposed to give A_transpose.
WIOD was also used for value added v_m and its Social and Economic
Account (SEA).
Payment for living wages were calculated based SEA and a review of data
and used to create a new value added vector v_living_wages.

A few points about matrices
Zero industry outputs in the vector x means errors with division by
zero when preparing the technical coefficient matrix. The file was prepared
 in excel to set these errors to zero but writing code would be better for
 a bigger file.
The price model can be expressed as (v_transpose. L) which gives the same
result as (L_transpose.v). However, the use of price balance equations
leads to A_transpose and then L_transpose so this was used to show the
relationship of the model to the accounting relations.
%}

% 1. Transpose of both technical coefficients and the Leontief inverse
%----------------------------------------------------------------------
%{
Z are the interindustry flows from WIOD 2011
reciprocal_of_x_elements is a vector of the reciprocals of the total output
x_diagonal_inverse is a matrix which puts the reciprocal of the total
output on the diagonal
 A is the matrix of technical coefficients
A_transpose it the transpose of the technical coefficients in the format
  required to generate the balance equations for price
L_transpose is the transpose of the Leotief inverse also known as the Ghosh
  inverse
v_m is a column vector of the existing market value added from WIOD 2011
change_v_low_skill_lw is a column vector which expresses the CHANGE in
 value added to provide payments to low skill labour to achieve a
 living wage. Similar vectors for medium, high and a summary of all skill
 are also used. The vectors are calculated from WIOD Social and
 Economic Accounts and a review of living wage data.
p_m is the existing market price calculated from the Leontief price model
 and the value added of v_m
change_p_low_skill_lw is the CHANGE in price price for payments to low
```

```
 skill labour to achieve a living wage and calculated from the
 Leotief price model - similarly for other skill levels and all skill
 levels

Outputs for the whole economy not just changes:
v_lw is a column vector which is the sum of existing WIOD value added
    and the change in value added for living wages
p_lw is a column vector which gives the price as as a result of existing
WIOD and additional living wage payments
%}

Z = xlsread('Z.xlsx');
reciprocal_of_x_elements = xlsread('reciprocal_of_x_elements.xlsx');
x_diagonal_inverse = diag(reciprocal_of_x_elements);
A = Z * x_diagonal_inverse;
A_transpose = transpose(A);
filename = 'A_transpose.xlsx';
xlswrite(filename,A_transpose);
I = eye(1435,1435);
L_transpose=inv(I-A_transpose);
filename = 'L_transpose.xlsx';
xlswrite(filename,L_transpose);


% 2. Price model and percentage changes in price for living wage payments
%------------------------------------------------------------------------
%{
A price vector (n*1) is calculated by multipling the Leontief inverse
transform L_transform (n*n matrix) by the value added column vector (n*1).
Value added column vectors from WIOD and for also including living wages
were calculated in <WIOD_SEA_Living_Wage_Estimate_Family.xlsx>
v_m
%}
v_m = xlsread('v_column_vector_WIOD.xlsx');
p_m = L_transpose * v_m;


% read in change in v for living wages by skill level data
change_v_low_skill_lw = xlsread('change_v_low_skill_lw.xlsx');
change_v_medium_skill_lw = xlsread('change_v_medium_skill_lw.xlsx');
change_v_high_skill_lw = xlsread('change_v_high_skill_lw.xlsx');
change_v_all_skill_lw = xlsread('change_v_all_skill_lw.xlsx');

% calculate change in price for living wages by skill level
change_p_low_skill_lw = L_transpose * change_v_low_skill_lw;
change_p_medium_skill_lw = L_transpose * change_v_medium_skill_lw;
change_p_high_skill_lw = L_transpose * change_v_high_skill_lw;
change_p_all_skill_lw = L_transpose * change_v_all_skill_lw;

% percentage change in price for living wages by skill level
% the ./ gives element wise division and mulitplication by a single number
% multiplies each element of the vector
pc_change_p_low_skill_lw = change_p_low_skill_lw ./ p_m *100;
pc_change_p_medium_skill_lw = change_p_medium_skill_lw ./ p_m *100;
pc_change_p_high_skill_lw = change_p_high_skill_lw ./ p_m *100;
pc_change_p_all_skill_lw = change_p_all_skill_lw ./ p_m *100;

% write percentage change in price results
filename = 'pc_change_p_low_skill_lw.xlsx';
xlswrite(filename,pc_change_p_low_skill_lw);
```

```
filename = 'pc_change_p_medium_skill_lw.xlsx';
xlswrite(filename,pc_change_p_medium_skill_lw);

filename = 'pc_change_p_high_skill_lw.xlsx';
xlswrite(filename,pc_change_p_high_skill_lw);

filename = 'pc_change_p_all_skill_lw';
xlswrite(filename,pc_change_p_all_skill_lw);


% 3. Direct and indirect contribution to value added
% --------------------------------------------------------------------
%
% p_lw_direct_pc_of_p_lw is the percentage of direct contribution to
% price to the living wage price calculated using the matrix inverse. The
% direct change is simply the change in value added.
% p_lw_indirect_pc_of_p_lw is simply the rest of the percentage
% contribution to give the total living wage price. This can also be
% approximate using the power series.

pc_direct_p_change_all_skill_lw = change_v_all_skill_lw ...
    ./ change_p_all_skill_lw  *100;
filename = 'pc_direct_p_change_all_skill_lw.xlsx';
xlswrite(filename, pc_direct_p_change_all_skill_lw);

pc_indirect_p_change_all_skill_lw=100 - pc_direct_p_change_all_skill_lw;
filename = 'pc_indirect_p_change_all_skill_lw.xlsx';
xlswrite(filename, pc_indirect_p_change_all_skill_lw);

% end
```

11.2 Structural Path Analysis – supply chain contributions to price change

```
%STRUCTURAL PATH ANALYSIS
%-----------------------------------------------------------------------

%{
Summary

This code performs a Structural Path Analysis of a matrix.
The code is for a Leontief price model - or cost push model.
The price model is based on price rather than output balance equations and
uses technical coefficients as output coefficients.

Also note that the social and environmental impacts are expressed as
changes in value added and not expressed as a satellite vector.
The code can be used on other matrices with a couple of modifications
including -
1. preparing the input files for the technical coefficient matrix
and changes in value added
2. setting the size of the matrix
3. setting the tolerance of how much a path must contribute to the total
to be considered in further production stages.

The first part of the code provides the transpose of technical
coefficients, the transpose of the Leontief inverse and the price model
using the matrix inverse based on data from WIOD,
http://www.wiod.org/new_site/home.htm

The main part of the code for the SPA follows the power series expansion
of the matrix inverse. The final part of the code checks how much of the
price was captured in the power series expansion. The results are then
expressed as percentage changes.

%}

% Contents
% ---------------------------------------------------------------------
%{
1. Transform of technical coefficients and transform of Leontief inverse
2. Defining total based on the matrix inverse, the quantity to be tracked,
    and the tolerance for considering further production stages
3. Algorithm for identifying and reducing the number of paths
4. Checking contribution to total by considering 7 stages of production
%}



% 1. Transform of technical coefficients and transform of Leontief inverse
% -------------------------------------------------------------------------

%{
Z are the interindustry flows from WIOD 2011
reciprocal_of_x_elements is a vector of the reciprocals of the total output
x_diagonal_inverse is a matrix which puts the reciprocal of the total
output on the diagonal
 A is the matrix of technical coefficients
A_transpose it the transpose of the technical coefficients in the format
  required to generate the balance equations for price
L_transpose is the transpose of the Leotief inverse also known as the Ghosh
```

```
  inverse
v_m is a column vector of the existing market value added from WIOD 2011
v_ghg is a column vector which expresses green house gas emissions
 as a change in value added. It was calculated from WIOD GHG emissions and
 IPCC WG 3 price to meet climate target of 450ppm
v_lw is a column vector which expresses payments to labour to
 achieve a living wage and is used as a change in value added. It was
 calculated from WIOD Social and Economic Accounts and a review of living
 wage data.
%}

Z = xlsread('Z.xlsx');

reciprocal_of_x_elements = xlsread('reciprocal_of_x_elements.xlsx');
x_diagonal_inverse = diag(reciprocal_of_x_elements);

A = Z * x_diagonal_inverse;
A_transpose = transpose(A);
filename = 'A_transpose.xlsx';
xlswrite(filename,A_transpose);

I = eye(1435,1435);
L_transpose=inv(I-A_transpose);
filename = 'L_transpose.xlsx';
xlswrite(filename,L_transpose);

% Change this file for considering a different change in value added
change_v_all_skill_lw = xlsread...
    ('change_v_all_skill_lw.xlsx');


% 2. Defining total based on matrix inverse, the quantity to be tracked
% per unit output and the tolerance for considering further
% production stages
% ----------------------------------------------------------------------
%{
The command 'tic' starts the computer clock for processing and 'toc' stops
    the clock when processing is finished
tolerance is the contribution to the total which must be met to consider
 further production stages
n is the number of dimensions of the square matrix. In this case
n is 1435 based on WIOT 2011 - this is needed to define the indices for
    tracking paths.
t is an index for the production tier (or stage or layer or next cycle of
 indirect interactions) but starts at 1 to avoid any issues in Matlab which
 requires indexes using real positive integers. This is only a place holder
 for writing the actual industry index to SPA from each 'for' loop.
%}
tic;
change_p_all_skill_lw = L_transpose * change_v_all_skill_lw;
tolerance = 0.0001;
n=1435;
t=1;

% 3. Algorithm for identifying and reducing the number of paths
% --------------------------------------------------------------------
%{
The SPA only considers the paths that make a contribution to a particular
industry price, i. In this case i= 669 which is 'Textiles and
textile products, IND' in WIOD. It might be possible to have a loop and do
a SPA of all industries i=1:n but it would take most of a day to calculate
```

```
and it is assumed that a particular industry is the focus of the analysis.
Seven production stages are considered, that is, the A matrix
is considered 7 times or A^7 for the effect of the inputs to the inputs on
the price being tracked. Miller and Blair (2006) that beyond A^7 the
terms in A^7 are not significantly different from zero. But, given that it
is an infinite series which keeps adding small quantities, part 4 of the
code calculates how much of the total is captured by the 7th production
stage.
%}

% Direct contribution
i=669;
    path_contribution(i)=change_v_all_skill_lw(i);
    SPA_lw(t,13)=path_contribution(i)/change_p_all_skill_lw(i)*100;
    SPA_lw(t,12)=path_contribution(i);
    SPA_lw(t,1)=i;

    % Production stage 1
    for j=1:n;
         path_contribution(j)=A(j,i)*change_v_all_skill_lw(j);
        if path_contribution(j)/change_p_all_skill_lw(i)<tolerance;
             %{
        if the contribution to industry i is too small, the condition
        is true and the command 'continue' sends the code to the end of
        this 'for' loop and all loops nested within, where it indexes to
        the next industry in i.
        If it is big enough the results are written and it considers the
        effect of this industry in the next production layer and so on
        until it ends up having a contribution that is too small.
        The first loop is for the direct contribution - the payment
        for living wages in the chosen industry. In this case it is
        expected that there will be a contribution.

        NOTE: The loop uses the A matrix and not its transpose. This is
        because individual technical coefficients are called by their row
        and column index. The main thing is to get the correct technical
        coefficient - and A is less confusing because the index of each
        'a' corresponds to the rows and columns when indexing the loop.

                %}
            continue
        else
            t=t+1;
        end
        SPA_lw(t,13)=path_contribution(j)/change_p_all_skill_lw(i)*100;
        SPA_lw(t,12)=path_contribution(j);
        SPA_lw(t,1)=i;
        SPA_lw(t,2)=j;

       % Production stage 2
       for k=1:n;
          path_contribution(k)= A(k,j)*A(j,i)...
              *change_v_all_skill_lw(k);
            if path_contribution(k)/change_p_all_skill_lw(i)<tolerance;
                continue
            else
                t=t+1;
            end
            SPA_lw(t,13)=path_contribution(k)/change_p_all_skill_lw(i)*100;
            SPA_lw(t,12)=path_contribution(k);
            SPA_lw(t,1)=i;
```

```
SPA_lw(t,2)=j;
SPA_lw(t,3)=k;

% production stage 3
for l=1:n;
    path_contribution(l)=A(l,k)*A(k,j)...
        *A(j,i)*change_v_all_skill_lw(l);
    if path_contribution(l)/change_p_all_skill_lw(i)<tolerance;
        continue
    else
        t=t+1;
    end
    SPA_lw(t,13)=path_contribution(l)...
        /change_p_all_skill_lw(i)*100;
    SPA_lw(t,12)=path_contribution(l);
    SPA_lw(t,1)=i;
    SPA_lw(t,2)=j;
    SPA_lw(t,3)=k;
    SPA_lw(t,4)=l;

    % Production stage 4
    % note the counter is the letter 'o' and not zero
    for o=1:n;
        path_contribution(o)=A(o,l)...
            *A(l,k)...
            *A(k,j)...
            *A(j,i)...
            *change_v_all_skill_lw(o);
        if path_contribution(o)...
                /change_p_all_skill_lw(i)<tolerance;
            continue
        else
            t=t+1;
        end
        SPA_lw(t,13)=path_contribution(o)...
            /change_p_all_skill_lw(i)*100;
        SPA_lw(t,12)=path_contribution(o);
        SPA_lw(t,1)=i;
        SPA_lw(t,2)=j;
        SPA_lw(t,3)=k;
        SPA_lw(t,4)=l;
        SPA_lw(t,5)=o;

        % Production stage 5
        for p=1:n;
            path_contribution(p)=A(p,o)...
                *A(o,l)*A(l,k)...
                *A(k,j)*A(j,i)...
                *change_v_all_skill_lw(p);
            if path_contribution(p)...
                    /change_p_all_skill_lw(i)<tolerance;
                continue
            else
                t=t+1;
            end
            SPA_lw(t,13)=path_contribution(p)...
                /change_p_all_skill_lw(i)*100;
            SPA_lw(t,12)=path_contribution(p);
            SPA_lw(t,1)=i;
            SPA_lw(t,2)=j;
            SPA_lw(t,3)=k;
```

```
                SPA_lw(t,4)=l;
                SPA_lw(t,5)=o;
                SPA_lw(t,6)=p;


                % production stage 6
                for q=1:n;
                    path_contribution(q)=A(q,p)...
                        *A(p,o)*A(o,l)...
                        *A(l,k)*A(k,j)...
                        *A(j,i)*change_v_all_skill_lw(q);
                    if path_contribution(q)...
                            /change_p_all_skill_lw(i)...
                            <tolerance;
                        continue
                    else
                        t=t+1;
                    end
                    SPA_lw(t,13)=path_contribution(q)...
                        /change_p_all_skill_lw(i)*100;
                    SPA_lw(t,12)=path_contribution(q);
                    SPA_lw(t,1)=i;
                    SPA_lw(t,2)=j;
                    SPA_lw(t,3)=k;
                    SPA_lw(t,4)=l;
                    SPA_lw(t,5)=o;
                    SPA_lw(t,6)=p;
                    SPA_lw(t,7)=q;

                % production stage 7
                    for r=1:n;
                        path_contribution(r)=A(r,q)...
                            *A(q,p)*A(p,o)...
                            *A(o,l)*A(l,k)...
                            *A(k,j)*A(j,i)...
                            *change_v_all_skill_lw(r);
                        if path_contribution(r)...
                                /change_p_all_skill_lw...
                                <tolerance;
                            continue
                        else
                            t=t+1;
                        end
                        SPA_lw(t,13)=path_contribution(r)...
                            /change_p_all_skill_lw(i)*100;
                        SPA_lw(t,12)=path_contribution(r);
                        SPA_lw(t,1)=i;
                        SPA_lw(t,2)=j;
                        SPA_lw(t,3)=k;
                        SPA_lw(t,4)=l;
                        SPA_lw(t,5)=o;
                        SPA_lw(t,6)=p;
                        SPA_lw(t,7)=q;
                        SPA_lw(t,8)=r;

                    end
                end
            end
        end
    end
end
```

```
    end

% note that the 'end' commands correspond and close each 'for' command

% 4. Checking contribution to total by considering 7 stages of production
%-----------------------------------------------------------------------
% This code just checks contribution of the power series to
% 7 produciton stages to the total
 change_p_lw_direct = change_v_all_skill_lw;
 change_p_lw_stage_1 = A_transpose*change_v_all_skill_lw;
 change_p_lw_stage_2 = A_transpose^2*change_v_all_skill_lw;
 change_p_lw_stage_3 = A_transpose^3*change_v_all_skill_lw;
 change_p_lw_stage_4 = A_transpose^4*change_v_all_skill_lw;
 change_p_lw_stage_5 = A_transpose^5*change_v_all_skill_lw;
 change_p_lw_stage_6 = A_transpose^6*change_v_all_skill_lw;
 change_p_lw_stage_7 = A_transpose^7*change_v_all_skill_lw;
 sum_direct_stage_7 = change_p_lw_direct...
     +change_p_lw_stage_1...
     +change_p_lw_stage_2...
     +change_p_lw_stage_3...
     +change_p_lw_stage_4...
     +change_p_lw_stage_5...
     +change_p_lw_stage_6...
     +change_p_lw_stage_7;

change_p_lw_power_series_stage_7_pc_of_p_lw = ...
     sum_direct_stage_7 ./change_p_all_skill_lw *100;
filename = 'change_p_lw_power_series_stage_7_pc_of_p_lw.xlsx';
xlswrite(filename,change_p_lw_power_series_stage_7_pc_of_p_lw);

% 5. Expressing results as percentage price changes
%---------------------------------------------------------------------
% The code first calculates the existing market price, p_m, using
% the existing market value added, v_m. The percentage change in price,
% p_lw_pc_change_p_m, from the price change for lw using element wise
% division.


v_m = xlsread('v_column_vector_WIOD.xlsx');
p_m = L_transpose * v_m;
p_lw_pc_change_p_m = change_p_all_skill_lw ./p_m *100;
filename = 'p_lw_pc_change_p_m.xlsx';
xlswrite(filename,p_lw_pc_change_p_m);
filename = 'p_m.xlsx';
xlswrite(filename,p_m);

Tpassed=toc;

save SPA_lw.mat;

filename = 'SPA_lw_21_sep.xlsx';
xlswrite(filename,SPA_lw);
% end
```

12 Results for price change greater than 1%

Supplementary Material Table 20. Industry-country pairs with price change greater than 1% from payments to meet the living wage gap

	Industry COUNTRY	Percentage price change
1	Private Households with Employed Persons MEX	78.62
2	Agriculture, Hunting, Forestry and Fishing IND	56.27
3	Agriculture, Hunting, Forestry and Fishing BRA	41.25
4	Private Households with Employed Persons CAN	38.51
5	Other Community, Social and Personal Services BRA	30.81
6	Food, Beverages and Tobacco IND	27.09
7	Hotels and Restaurants IND	23.21
8	Private Households with Employed Persons IRL	22.83
9	Agriculture, Hunting, Forestry and Fishing IDN	22.14
10	Leather, Leather and Footwear IND	19.38
11	Private Households with Employed Persons ITA	16.99
12	Wood and Products of Wood and Cork IND	16.63
13	Food, Beverages and Tobacco BRA	16.55
14	Other Community, Social and Personal Services CHN	15.49
15	Wood and Products of Wood and Cork BRA	13.51
16	Textiles and Textile Products BRA	13.17
17	Hotels and Restaurants BRA	13.00
18	Private Households with Employed Persons CYP	12.47
19	Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods BRA	12.04
20	Textiles and Textile Products IND	10.79
21	Private Households with Employed Persons IND	9.74
22	Food, Beverages and Tobacco IDN	8.44
23	Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods CHN	8.11
24	Education IDN	7.08
25	Wood and Products of Wood and Cork IDN	6.63
26	Pulp, Paper, Paper , Printing and Publishing BRA	6.52
27	Health and Social Work IDN	6.40
28	Private Households with Employed Persons AUT	6.25
29	Leather, Leather and Footwear BRA	6.15
30	Agriculture, Hunting, Forestry and Fishing RUS	5.72
31	Rubber and Plastics IND	5.51
32	Agriculture, Hunting, Forestry and Fishing JPN	5.41
33	Agriculture, Hunting, Forestry and Fishing MEX	5.25
34	Renting of M&Eq and Other Business Activities BRA	5.16
35	Hotels and Restaurants IDN	5.14
36	Real Estate Activities TUR	5.12
37	Hotels and Restaurants KOR	4.76
38	Pulp, Paper, Paper , Printing and Publishing IND	4.61
39	Manufacturing, Nec; Recycling BRA	4.43

40	Private Households with Employed Persons BEL	4.38
41	Water Transport BRA	4.30
42	Air Transport BRA	4.23
43	Private Households with Employed Persons DNK	4.11
44	Manufacturing, Nec; Recycling IDN	3.75
45	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies BRA	3.53
46	Post and Telecommunications BRA	3.36
47	Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods IDN	2.94
48	Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel BRA	2.93
49	Inland Transport BRA	2.87
50	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles TUR	2.76
51	Hotels and Restaurants TUR	2.66
52	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles IDN	2.61
53	Health and Social Work BRA	2.49
54	Other Non-Metallic Mineral BRA	2.43
55	Rubber and Plastics BRA	2.36
56	Hotels and Restaurants MEX	2.36
57	Health and Social Work IND	2.31
58	Chemicals and Chemical Products BRA	2.17
59	Education BRA	2.01
60	Other Community, Social and Personal Services TUR	2.00
61	Chemicals and Chemical Products IND	1.98
62	Transport Equipment BRA	1.91
63	Mining and Quarrying BRA	1.89
64	Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods TUR	1.81
65	Other Community, Social and Personal Services GRC	1.80
66	Wood and Products of Wood and Cork MEX	1.79
67	Leather, Leather and Footwear IDN	1.78
68	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles BRA	1.77
69	Food, Beverages and Tobacco RUS	1.76
70	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies IND	1.74
71	Machinery, Nec BRA	1.74
72	Food, Beverages and Tobacco TWN	1.63
73	Electrical and Optical Equipment BRA	1.54
74	Water Transport IND	1.54
75	Renting of M&Eq and Other Business Activities GRC	1.52
76	Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods KOR	1.47
77	Construction IND	1.45
78	Other Non-Metallic Mineral IND	1.43
79	Coke, Refined Petroleum and Nuclear Fuel BRA	1.39
80	Other Community, Social and Personal Services LUX	1.39

81	Education IND	1.38
82	Inland Transport IND	1.35
83	Financial Intermediation BRA	1.33
84	Construction BRA	1.32
85	Agriculture, Hunting, Forestry and Fishing CAN	1.31
86	Wood and Products of Wood and Cork RUS	1.29
87	Electricity, Gas and Water Supply BRA	1.28
88	Textiles and Textile Products IDN	1.28
89	Financial Intermediation GRC	1.27
90	Basic Metals and Fabricated Metal BRA	1.26
91	Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods MEX	1.21
92	Financial Intermediation IDN	1.20
93	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies IDN	1.07
94	Public Admin and Defence; Compulsory Social Security BRA	1.06
95	Manufacturing, Nec; Recycling IND	1.06
96	Other Community, Social and Personal Services IDN	1.05
97	Construction TUR	1.05
98	Health and Social Work TUR	1.04
99	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies CHN	1.04
100	Real Estate Activities KOR	1.03
101	Renting of M&Eq and Other Business Activities IDN	1.01
102	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles KOR	1.00

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