Marmara Üniversitesi İktisadi ve İdari Bilimler Dergisi • Cilt: 41 • Sayı: 2 • Aralık 2019, ISSN: 2149-1844, ss/pp. 473-492
DOI: 10.14780/muiibd.665744

ARAŞTIRMA MAKALESİ / RESEARCH ARTICLE

OCCUPATIONAL INJURIES AND WAGE DIFFERENTIALS IN TURKEY

TÜRKİYE'DE İŞ KAZALARI VE ÜCRET FARKLARI

Ayça AKARÇAY[*]
Sezgin POLAT[**]

Abstract

We test the compensating wage differentials hypothesis for the manufacturing industry in Turkey using occupational injury data from the Ministry of Labor and Social Security and wage data from Household Labor Force Surveys, for the 2013-2017 period. First, we estimate a standard hedonic wage equation for the fatal and non-fatal injury risk. In conformity with the standard CWD hypothesis we find a positive relation between occupational risks and wage however after controlling for industry effects, the relation becomes insignificant. For an alternative estimation, we use a two-step procedure. Besides an insignificant and negative effect of risk, poor working conditions are associated with lower wages for the male population, which suggest a segmented labor market.

Keywords: Hedonic wages; Compensating wage differentials; Working hours; Occupational injuries; Turkey.

JEL Classification: C31, J28, J31.

Özet

Çalışma ve Sosyal Güvenlik Bakanlığı'nın iş kazaları ve Hanehalkı İşgücü Anketleri ücret verilerini kullanarak, Türkiye'deki imalat sanayi için telafi edici ücret farkları hipotezini 2013-2017 dönemi için test ediyoruz. İlk olarak, ölümcül ve ölümcül olmayan kaza riski için standart bir hedonik ücret denklemi tahmin ediyoruz. Standart telafi edici ücret farkları hipotezine uygun olarak, mesleki riskler ve ücret arasında pozitif bir ilişki buluyoruz, ancak endüstri etkilerini kontrol ettikten sonra ilişki önemsiz hale geliyor. Alternatif bir tahmin olarak, iki aşamalı bir prosedür kullanıyoruz. Riskin anlamsız ve negatif bir etkisinin yanı sıra, erkek nüfusu için kötü çalışma koşullarının düşük ücretlerle ilişkilendirilmesi bölünmüş bir işgücü piyasasına işaret etmektedir.

[*] Assoc. Prof., Galatasaray University, Economics Department and GIAM, Ortaköy-İstanbul, aakarcay@gsu.edu.tr
[**] Assoc. Prof., Galatasaray University, Economics Department and GIAM, Ortaköy-İstanbul, spolat@gsu.edu.tr

Makale Gönderim Tarihi: 06.09.2019
Yayına Kabul Tarihi: 19.11.2019

Anahtar Kelimeler: Hedonik ücretler; Telafi edici ücret farkları; Çalışma saatleri; İş kazaları; Türkiye.

JEL Sınıflandırması: C31, J28, J31.

1. Introduction

The theory of equalizing differences suggests that, among other factors, wage differentials should reflect the work environment and working conditions (Rosen, 1986).[1] Hard or poor conditions are generally associated with dangerous jobs and working environments where workers are more exposed to accident risks or jobs that require overtime and longer hours where wages are expected to be relatively higher, i.e. the wage differential is expected to compensate for the working conditions (compensating wage differential, CWD).

There are very few studies which directly deal with the wage compensation and working conditions in Turkey. The higher incidence of fatal work accidents is documented in Toksöz (2008)[2] and OECD (2006)[3], while Messenger (2011)[4] reports that, among European countries, Turkey is an exceptional case in that low wages and longer hours are correlated. In developing countries, weak regulations and institutions worsen working conditions (e.g. poorer work safety and more accidents), particularly in rapidly growing sectors facing global competition Hamalainen (2009)[5], although poor working conditions also undermine productivity. Table 1 gives working hours in a global perspective where Turkey ranks among the highest. Finally, Turkey scores relatively high levels of subjective work intensity and working time and poor levels of physical environment among European countries (Eurofound, European Working Conditions Surveys)[6].

1 Rosen, S. (1986). The theory of equalizing differences. Handbook of Labor economics, 1:641-692.

2 Toksöz, G. (2008). Decent work country report – Turkey. International Labour Organization.

3 OECD (2006). Society at a Glance. OECD Social lndicators. Organisation for Economic Co-operation and Development.

4 Messenger, J. C. (2011). Working time trends and developments in Europe. Cambridge Journal of Economics, 35(2):295-316.

5 Hamalainen, P. (2009). The effect of globalization on occupational accidents. Safety Science, 47(6):733-742.

6 Eurofound. European Working Conditions Surveys. https://www.eurofound.europa.eu/data/european-working-conditions-survey

Table 1: Mean weekly hours actually worked per employee in the manufacturing sector

Country	2013	2014	2015	2016	2017	2013-2017	Country	2013	2014	2015	2016	2017	2013-2017
Netherlands	35	36	36	36	36	36	Chile					43	43
Liberia		36				36	Ghana			43			43
Timor-Leste	40			33		37	Serbia	44	42	43	44	43	43
France	37	36	37	37	37	37	Hong Kong, China	44	43	43	43		43
Australia	37	37	37	37	37	37	Argentina	44	44		43	43	44
Austria	37	37	37	37	37	37	Kyrgyzstan			44	44	43	44
Denmark	37	37	37	37	37	37	Ecuador	45	43	43	44		44
New Zealand	37	37	37	37	37	37	Montenegro	44	44	44	43	44	44
Norway	37	37	37	37	37	37	Samoa		43			45	44
Belgium	37	37	37	38	37	37	Cayman Islands	43	46	45			45
Sweden	38	37	37	38	37	37	Indonesia	44	45	45			45
Germany	37	38	38	38	37	38	Dominican Republic			45	45	45	45
Finland	38	37	38	38	38	38	Lao People's Democratic Rep.					45	45
Italy	38	38	38	38	38	38	Panama	46	45	45	45	44	45
Rwanda					38	38	Occupied Palestinian Territory	46		45	45	45	45
Ireland	38	38	38	38	39	38	Belize			47	47	42	45
Czech Republic	39	38	38	39	38	38	El Salvador	46	46	45	45	45	45
Hungary	39	38	38	39	38	38	Albania				46	45	46
Slovakia	39	38	39	38	38	38	Korea, Republic of			46	46	45	46
Malta	39	39	39	39	39	39	Armenia		47	46	46	45	46
Spain	39	39	39	39	39	39	Georgia					46	46
Cyprus	39	39	39	39	40	39	Mali		46	45	48		46
Croatia	40	40	39	39	39	39	Madagascar			47			47
Estonia	39	39	39	40	40	39	Philippines	47	47	46	48	47	47
Latvia	39	39	39	40	40	39	Guatemala	40	50	48	51		47
Greece	40	40	39	40	40	40	Mexico	47	47	47	48	48	47
Slovenia	40	40	40	40	39	40	Sri Lanka	47	47	48	48		48
Ukraine	40	40	39	40	40	40	Costa Rica					48	48
Bulgaria	40	40	40	40	40	40	Nepal					48	48
Israel					40	40	Honduras			48	49	48	48

Lithuania	40	40	40	40	40	40	Egypt	49		50	48	48	49
Moldova, Rep. of			40	40	40	40	Mongolia	49	49	48	49	49	49
Portugal	40	40	40	40	40	40	Iran, Islamic Rep. of					49	49
Russian Federation					40	40	Kosovo		47		51		49
Switzerland	40	40	40	40	40	40	Malaysia	49	49	49	49		49
United Kingdom	40	40	40	40	40	40	Namibia	49	50		48		49
Luxembourg	40	41	40	41	39	40	Viet Nam	50	49	49	49	48	49
United States	40	41	40	40	40	40	Zambia					49	49
Poland	41	41	41	41	40	41	Qatar	50	50	49	48	49	49
Kazakhstan					41	41	Thailand	50	49	49	49	49	49
Mauritius	41	40	41	41	42	41	***Turkey***	***50***	***50***	***49***	***49***	***49***	***49***
Romania	42	41	41	41	41	41	Côte d'Ivoire					50	50
Iceland	42	41	42	43	42	42	Myanmar			52		50	51
Japan	42	42	42	42	42	42	Pakistan	51	51	51	51		51
Seychelles		42	44	41	41	42	Saudi Arabia		52	50			51
Sierra Leone		42				42	Senegal			51			51
Brazil	42	42	42	42	42	42	Brunei Darussalam		53			51	52
North Macedonia	43	42	42	43	43	43	Bangladesh	50			57	56	54
Bosnia and Herzegovina		43				43	Tanzania, United Rep. of		59				59
Cape Verde					43	43	Togo		60				60
							Average	42	43	43	43	42	43
							Median	40	41	42	41	41	43

Source: ILOSTAT – "Working time" data, https://www.ilo.org/ilostat/

Note. For compatibility reasons, only data from Labor Force Survey sources are reported

Table 2: Fatal occupational injuries per 100'000 workers in the manufacturing sector

Country	Type of Source	2009	2010	2011	2012	2013	2014	2015	2016	2017	2009-2017
Austria	Insurance records	1.5	2.2	2.7	1.4	1.8	2	1.5	1.9		1.9
Azerbaijan	Labour inspectorate records								8	7	7.5
Belarus	Establishment survey								1.8	2.4	2.1
Belgium	Insurance records	2.1	1.8	1.8	2	2.3	3.2	2.7			2.3
Brazil	Insurance records			8.5							8.5
Bulgaria	Insurance records	3.3	3	2.8	3.7	3.7	6.1	3.6	2.4		3.6
Colombia	Other administrative records and related sources					10.4		7.3		0	5.9
Croatia	Insurance records	2.2	2.7	3.2	4.2	1.3	1.3	1.8	2.9		2.5
Cuba	Other administrative records and related sources	3	2								2.5
Cyprus	Labour inspectorate records	2.9	6.2	3.9	4.2	7.3	5.3	0	0		3.7
Czech Republic	Labour inspectorate records	2.1	2	2.5	1.7	2.1	1.7	2.1			2.0
Denmark	Other administrative records and related sources	1.1	1.6	1.7	2.1	1.2	2.5	1.2			1.6
Egypt	Establishment survey			4.5	4.2		10.8	8.4			7.0
Estonia	Labour inspectorate records	1.8	0	2.5	1.7	4.3	0	3.5	4.1		2.2
Finland	Other administrative records and related sources	0.3	2.1	0.3	1.4	1.1	1.2				1.1
France	Insurance records	2.5	2.4	2.6	2.9	2.3	2.8	2.6			2.6
Germany	Insurance records	0.8	1.2	0.8	1	1	0.9	1			1.0
Greece	Insurance records	1	0.4	1.4	1.7	0.9	1.6	3.2			1.5
Hong Kong, China	Labour inspectorate records	5	12	12	10	9	4	10	13.5		9.4
Hungary	Labour inspectorate records	1.4	2	2	1	0.6	1.8	1.4	1.1		1.4
Iceland	Other administrative records and related sources			0	0	0		5.3			1.3
Ireland	Labour inspectorate records	0.5	1	0.9	0	0.5	1.4	1.4			0.8
Israel	Labour inspectorate records				4.3		4.7	2.6	2.9		3.6
Italy	Insurance records	2.7	2.4	2.6	2.6	2.2	2	2.3			2.4
Japan	Establishment survey								1	1	1.0
Kazakhstan	Establishment or business register		11.4			11.2		7.2		7.9	9.4
Kyrgyzstan	Labour inspectorate records					9					9.0
Latvia	Labour inspectorate records	6	3.5	6.4	5.2	5	5	5.6			5.2

Lithuania	Labour inspectorate records	5.1	5.2	3.6	1.7	4.5	2.6	3.1	5.6		3.9
Luxembourg	Insurance records	3	6.3	0	3.1	0	0	3.2			2.2
Malta	Other administrative records and related sources	4.2	0	0	0	0	0	4.3	0		1.1
Mexico	Insurance records						5.3				5.3
Moldova, Rep.	Establishment survey								8.1	2.5	5.3
Mongolia	Official estimate								4.7	4.3	4.5
Myanmar	Labour inspectorate records	8.9	6.7	5.4	3.8	3.7	2.9	3.6	4.1	2.6	4.6
Netherlands	Insurance records	1.8	1.2	1	1.1	0.7	1.7	1.4			1.3
New Zealand	Insurance records				1.3						1.3
Nicaragua	Other administrative records and related sources	12.8	12.1								12.5
Norway	Labour inspectorate records	2.9	3	2.2	1.8	1.4	2.6	0.8			2.1
Panama	Labour inspectorate records			0.9	0.9	0.8		0.3	0.2		0.6
Philippines	Establishment survey			4.1		4		1.2			3.1
Poland	Establishment survey	3.7	3	2.8	2.3	2	2.1	2.5			2.6
Portugal	Insurance records	3.4	3.3	3.7	4.5	3.6	3.4	2.2			3.4
Romania	Labour inspectorate records	5.5	7.3	6.6	5	5.1	4.1	4	2.9		5.1
Russian Federation	Establishment survey									4	4.0
Singapore	Labour inspectorate records	2.6	1.6	3.1	2.8	1.4	1.4	1.4	2.2	1.7	2.0
Slovakia	Labour inspectorate records	1.7	2.6	1.9	2.6	2.4	1.3	1.5	1		1.9
Slovenia	Other administrative records and related sources	2.5	2.7	1.6	3.9	2.8	2.2	3.8			2.8
Spain	Insurance records	3	3.3	3.1	2.9	2.6	1.7	4.4	2.7		3.0
Sri Lanka	Labour inspectorate records						1.6	1.9	1.6	1.7	1.7
Sweden	Other administrative records and related sources	2	1.7	2	1.3	1.5	0.6	0.8	0		1.2
Switzerland	Other administrative records and related sources	1.6	2.2	1.6	1.2	2.6	1.4	1.7			1.8
Turkey	***Insurance records***	***3.5***	***8.7***	***9.9***	***3.8***	***6.6***	***5.9***	***5.4***	***6.1***		***6.2***
Ukraine	Establishment survey					4.9	5	4.3	5.3	4.4	4.8
United Kingdom	Insurance records	0.9	1	1.2	0.7	0.8	0.7	0.9			0.9
United States	Other administrative records and related sources	2.3	2.2	2.2	2.1	2.1	2.3	2.9	2.4		2.3
Average		*3.0*	*3.5*	*3.0*	*2.6*	*3.1*	*2.7*	*3.0*	*3.3*	*3.3*	*3.5*
Median		*2.5*	*2.4*	*2.5*	*2.1*	*2.3*	*2.1*	*2.6*	*2.6*	*2.6*	*2.5*

Source: ILOSTAT – "Safety and health at work" data, https://www.ilo.org/ilostat/

Table 3: Non-fatal occupational injuries per 100'000 workers in the manufacturing sector

Country	Type of Source	2009	2010	2011	2012	2013	2014	2015	2016	2017	2009-2017
Austria	Insurance records		2569	2665	2377	2333	2214	2060	2629		2407
Azerbaijan	Labour inspectorate records								29	19	24
Belarus	Establishment survey								57	57	57
Belgium	Insurance records	2550	2595	2690	2440	2322	2236	1695			2361
Brazil	Insurance records			2646							2646
Bulgaria	Insurance records	123	121	113	111	105	110	106	105		112
Colombia	Other administrative records and related sources					9370		10505		4	6626
Croatia	Insurance records	1996			1591	1238	1336	1326	1473		1493
Cuba	Other administrative records and related sources	117	118								118
Cyprus	Labour inspectorate records	1576	1496	1615	1452	1109	1632	1117	1525		1440
Czech Republic	Other administrative records and related sources	2309	2603	1486	1421	1415	1423	1485	1718		1732
Denmark	Other administrative records and related sources	2841	3017	2936	2434	2324	2272	2040			2552
Egypt	Establishment survey			996	996			2404			1465
Estonia	Labour inspectorate records	1585	1894	1739	1851	2417	2385	2296	1227		1924
Finland	Other administrative records and related sources	2537	2523	2687	2462	2190	2174				2429
France	Insurance records	2781	2868	3418	2729	2689	2934	2601			2860
Germany	Insurance records	2271	2742	2744	2645	2643	2503	2474			2574
Greece	Insurance records	1241	942	881	792	746	238	318			737
Hong Kong, China	Labour inspectorate records	2229	2365	2434	2536	2378	2368	2658	2090		2382
Hungary	Labour inspectorate records	800	880	881	894	834	828	901	919		867
Iceland	Other administrative records and related sources			1526	2094	2460		2615			2174
Ireland	Labour inspectorate records	385	744	1327	874	1133	1390	1426			1040
Israel	Insurance records				2683		2647		2305		2545
Italy	Insurance records	2415	2403	2135	1826	1756	1652	1603			1970
Japan	Establishment survey								230	220	225
Kazakhstan	Establishment or business register					200		147		121	156
Kyrgyzstan	Labour inspectorate records					125		87			106
Latvia	Labour inspectorate records	229	257	341	361	419	453	476			362

Lithuania	Labour inspectorate records	325	350	358	429	405	453	494	655		434
Luxembourg	Insurance records	2362	2477	2507	2386	2811	5117	2454			2873
Malta	Other administrative records and related sources	2834	2813	2415	3113	2645	2518	2144	0		2310
Mexico	Insurance records			3695	3593	3399	3250	3281	3020	2732	3282
Moldova, Rep.	Establishment survey								92	94	93
Mongolia	Official estimate								33	62	47
Myanmar	Labour inspectorate records	30	12	17	10	8	8	17	26	19	16
Netherlands	Insurance records	2729	3297	3130	3634	3033	1636	1812	6700		3246
New Zealand	Insurance records				1100			2200			1650
Nicaragua	Other administrative records and related sources	13001	12840								12921
Norway	Labour inspectorate records	4561	3220	2117	3049	1301	624	609			2212
Panama	Labour inspectorate records			1	5	5	1	0	0		2
Philippines	Establishment survey					1026		886			956
Poland	Establishment survey	1759	1220	1028	1127	997	986	875			1142
Portugal	Insurance records	4656	4419	4272	4466	4597	4720	4296			4489
Romania	Labour inspectorate records	77	128	112	107	114	101	112	124		109
Russian Federation	Establishment survey									153	153
Singapore	Labour inspectorate records						713	639	548	612	628
Slovakia	Labour inspectorate records	797	918	806	763	618	641	665	679		736
Slovenia	Other administrative records and related sources	2819	2933	2853	2706	2327	2222	2237			2585
Spain	Insurance records	6412	6164	4538	3696	3672	3877	3949	5193		4688
Sri Lanka	Labour inspectorate records						70	66	73	74	71
Sweden	Other administrative records and related sources	927	1025	998	1026	991	981	970	1179		1012
Switzerland	Other administrative records and related sources	1805	2236	1985	2124	2401	2342	2057			2136
Turkey	***Insurance records***	***1271***	***1124***	***1102***	***1103***	***2261***	***2586***	***2736***	***3055***		***1905***
Ukraine	Establishment survey					105	75	79	71	84	83
United Kingdom	Insurance records	1215	1159	1281	1245	1257	1284	1125			1224
United States	Establishment survey	1000	1100	1100	1100	1000	1000	1000	900		1025
Average		*2188*	*2216*	*1831*	*1784*	*1790*	*1650*	*1668*	*1264*	*327*	*1739*
Median		*1805*	*2236*	*1677*	*1709*	*1358*	*1527*	*1426*	*679*	*84*	*1453*

Source: ILOSTAT – "Safety and health at work" data, https://www.ilo.org/ilostat/

International comparisons are extremely difficult due to the heterogeneities across countries in terms of laws, quantitative and qualitative inspection capacity and law enforcement on the one hand, and in terms of data collection and population coverage on the other. Two major discrepancies across definitions are: population coverage (typically in Turkey the main data source is the insurance records hence only the insured sector which covers formal employment and injury cases reported to the insurance; also note that data from establishment surveys in developing countries usually do not cover all types of establishments, notably in terms of size) and the definition of occupational injury[7] (e.g. whether commuting accidents are included or not). A supplementary issue is the bias in fatal versus non-fatal injuries: fatal injuries are relatively less subject to record bias because the injury is more explicit and non-recording is less prevalent compared to non-fatal injuries. More, the compensation is paid to the family survivor(s) ex-post (once the accident has occurred) which is relatively less subject to negotiation compared to wage. Nevertheless, both types of injuries are likely to be undercounted in countries with poorer laws or poorer enforcement capacity.

ILO's data on "Safety and Health at Work" provides the largest country coverage, Tables 2 and 3 give comparative data for countries for which both fatal and non-fatal occupational injuries data in the manufacturing sector is available for any given year between 2009-2017. With these limitations in mind (notably variations in the data source and coverage of employees)[8], Turkey stands above average and median values for all the years data is available and period average for fatal occupational injuries (Table 2), without and particular increasing or decreasing trend. The variance in non-fatal occupational injuries is higher than that in fatal injuries as expected, and, for a number of countries, data less reliable.

For Turkey, there is a break in 2013 which is due to a reform in the law on occupational health and safety[9] which has amended the previous law by implementing compulsory register of occupational injuries by the employer. Until 2012, the statistics of insured persons victim of occupational injuries reported the number of occupational injuries for which the compensation was paid and the case was closed. As of 2013, following the European Statistics on Accidents at Work (ESAW) "accidents at work resulting in more than three days of absence from work" are recorded, [10] in other words the establishment is held to register all work accidents for which

7 "Occupational injuries" is the term used by ILO, alternatively "occupational accidents", "work accidents", "work injuries" are synonyms, they cover both fatal (deathly) and non-fatal injuries if not mentioned otherwise.

8 Due to data scarcity we report figures from all types of sources, limiting the figures to the same data source would have substantially limited the number of comparable countries.

9 Act No. 6331 on Occupational Health and Safety, Resmi Gazete, 2012-06-30, No. 28339, https://www.ilo.org/dyn/natlex/docs/ELECTRONIC/92011/106960/F196.439.3422/TUR-2012-L-92011.pdf
For the unofficial English translation: https://www.ilo.org/dyn/natlex/docs/MONOGRAPH/92011/106963/F102.823.1731/TUR92011%20Eng.pdf
For more details on the evolution of legal regulation of occupational health and safety in Turkey see Bilir, N. (2016). Occupational Safety and Health Profile: Turkey. ILO.

10 "Only full calendar days of absence from work have to be considered, excluding the day of the accident. Consequently, 'more than three calendar days' means 'at least four calendar days', which implies that only if the victim resumes work on the fifth (or subsequent) working day after the date on which the accident occurred should the incident

victims resume work on the fifth day after the day of the accident or later, regardless of the status of the compensation and the case. This reform clearly shows how the statistics are sensitive to rules, and non-fatal injuries even more so. Turkey is below average and median until 2012, and above thereafter with an increasing trend. Given that the statistics following the reform are more accurate we can conclude that occupational injury risk in Turkey, fatal and non-fatal, is relatively high in comparison with world averages.

In the following section we present the data, the estimation strategy and results. The basic hedonic OLS estimations yield inconsistent results: we first find a significant and positive wage compensation, when we add industry-fixed effects the compensation becomes insignificant and negative. Then, using a two-step strategy which allows for multi-level estimation, we regress industry wage differentials on working conditions proxies. Our results suggest that wage differentials do not reflect wage compensation for poorer industry-specific working conditions, which include long hours, informal employment and on-the-job-search rates (proxy for job satisfaction), especially for the male population. These findings support the labor market segmentation thesis, which seem to be more relevant than the compensating wage differential theory in the context of developing countries in riskier sectors with poorer working conditions and greater power asymmetry that countervails the impact predicted by the CWD.

2. Hedonic Wage Regression

Turkey's Household Labor Force Surveys (HLFS) provide detailed information on wages and work characteristics. In order to estimate the wage premium related to unsafe work, we use accident rates from the official occupational injury figures that are collected through the Social Security Institution's (SSI) records and provided by Turkey's Ministry of Labor and Social Security (MoLSS). The MoLSS's industry classification, which is compatible with the HLFS, has a broad coverage including 24 sub-sectors of manufacturing industry (NACE, rev. 2). We limit our study to the manufacturing sector because although non-manufacturing sectors such as construction, mining or transportation may be riskier, the two-digit classification is insufficient to capture heterogeneities within the sectors.

We run our estimates for the whole population and for the male population separately: men are more affected by occupational injuries as they are more likely to work in riskier jobs which causes a selection issue and different CWDs across gender. Our data are pooled cross-sections covering the 2013-2017 period given the break in the non-fatal occupational injury data. The accident figures include only formally employed wage-earning workers who are subject to social security coverage (under Article 4-1/a of Act 5510). The total number of workers corresponding to each sector are obtained from the MoLSS and per worker figures are calculated according to the number of registered (formal) workers in each industry.[11]

be included." European Union (2012) European Statistics on Accidents at Work (ESAW). Summary methodology. Eurostat Methodologies and Working papers.

11 For developing economies, ignoring the amount of informal employment and the importance self-employment

The standard hedonic wage model Eq. (1) estimated in this study combines the usual wage equation with a compensation factor for the risk to wage earners associated with each specific industry.

$$\ln(w_{ijt}) = \alpha + \beta X_{ijt} + \theta I_{jt} + \gamma p_{jt} + \varepsilon_{ijt} \quad (1)$$

In Eq. (1), w_{ijt} denotes the log real hourly wage expressed in 2017 prices of individual *i* in industry *j* in year *t*. X_{ijt} is a set of individual covariates including gender, age, age squared, birth place (local or not), education (5 categories), marital status (4 categories), employment sector (public or not), tenure years, tenure years squared, regular working hours and firm size (3 categories). I_{jt} indicates the industry averages of variables that are likely to capture working conditions (average regular working hours, average years of job tenure, share of workers with post-secondary ratio and on-the-job search ratio)[12], γ denotes the compensation associated with the industry specific occupational fatal or non-fatal injury risk for a given year, p_{jt}, and ε_{ijt} is the error term. Estimations include NUTS1 level regions (12 regions), occupations (9 categories) at the individual level, also industry (23 industries)[13] fixed effects (when specified) and year (5 years) fixed effects. Table 4 gives a brief description of data that will be used in regressions.

Table 4: Summary statistics (pooled cross-sections, 2013-17)

	All workers		Men	
Variables	Mean	Std. Dev.	Mean	Std. Dev.
Fatal injury per 10000 worker	0.78	0.61	0.98	0.69
Non-fatal injury per 100 worker	3.57	1.92	4.04	2.04
Individual characteristics of employee				
Female=1	0.21	0.41		
Age	34.96	9.45	35.21	9.48
Local=1	0.56	0.50	0.57	0.50
Education				
No schooling	0.02	0.15	0.02	0.14
Primary	0.33	0.47	0.32	0.47
Lower secondary	0.23	0.42	0.24	0.43
Upper secondary	0.27	0.45	0.29	0.45
Tertiary	0.14	0.35	0.13	0.34
Marital status				

biases the true accident cases in each sector. Hamalainen et al. (2009) argue that the global figures provided by the ILO underestimate the true level of accidents. Hamalainen, P., Leena Saarela, K., and Takala, J. (2009). Global trend according to estimated number of occupational accidents and fatal work-related diseases at region and country level. Journal of Safety Research, 40(2):125-139.

12 The inclusion of industry-specific averages might help isolate omitted factors. Krueger and Summers (1988) find that, in OLS estimations, controlling for working conditions does not change pay differentials across industries. These variables are constructed using the HLFS. Krueger, A. B. and Summers, L. H. (1988). Efficiency wages and the inter-industry wage structure. Econometrica. Journal of the Econometric Society, 259-293.

13 The NACE rev. 2 definition includes 24 industries within the manufacturing sector, we omit the sub-sector of "Manufacture of tobacco products" because of the insufficient number of observations.

Never Married	0.25	0.43	0.24	0.43
Married	0.72	0.45	0.74	0.44
Divorced	0.03	0.16	0.02	0.13
Spouse Died	0.00	0.06	0.00	0.04
Employment characteristics				
Public employee	0.02	0.12	0.02	0.14
Tenure years	5.39	6.11	5.82	6.39
Regular working hours	50.25	8.28	50.70	8.50
Firm size (<11))	0.14	0.35	0.15	0.36
Firm size (11 – 49)	0.25	0.43	0.25	0.43
Firm size (>49)	0.61	0.49	0.60	0.49
Industry specific variables				
Average regular working hours	50.54	2.20	51.05	2.54
Post-secondary worker ratio	0.15	0.07	0.14	0.07
Average years of job tenure	5.63	0.67	6.09	0.57
Informal worker ratio	0.18	0.11	0.14	0.09
On-the-job search ratio	0.02	0.01	0.02	0.01
No. Observations	94.377	94.377	74.476	74.476

Table 5: Hedonic wage regressions (OLS, pooled cross-sections, 2013-17)

	All workers					Men				
	(1a)	(2a)	(3a)	(4a)	(5a)	(1b)	(2b)	(3b)	(4b)	(5b)
Fatal injury per 10000 worker	2.445*		0.038		-0.229	2.313**		0.355		-0.148
	(1.228)		(0.428)		(0.469)	(1.073)		(0.384)		(0.445)
Non-fatal injury per 100 worker		0.012***		-0.006	-0.007		0.012***		0.000	-0.000
		(0.003)		(0.006)	(0.007)		(0.003)		(0.008)	(0.008)
Average regular working hours					-0.005					-0.007
					(0.004)					(0.005)
Post-secondary worker ratio					0.069					0.111
					(0.195)					(0.162)
Average years of job tenure					0.003					0.002
					(0.007)					(0.005)
Informal worker ratio					-0.076					-0.141
					(0.085)					(0.086)

On-the-job search ratio					-0.153					-0.307
					(0.328)					(0.269)
Constant	2.590***	2.578***	2.605***	2.619***	2.905***	2.554***	2.539***	2.586***	2.589***	2.977***
	(0.064)	(0.067)	(0.069)	(0.075)	(0.269)	(0.064)	(0.064)	(0.068)	(0.068)	(0.286)
Year effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry effects	no	no	yes	yes	yes	no	no	yes	yes	yes
Observations	94,377	94,377	94,377	94,377	94,377	74,476	74,476	74,476	74,476	74,476
R-squared	0.595	0.596	0.603	0.603	0.603	0.586	0.587	0.595	0.595	0.595

Omitted categories: no schooling for education, less than 10 workers for firm size, 2013 for the year effect, food sector for the industry effect, executive managers for occupations, Istanbul province for regions.

All estimations include covariates for individual characteristics, 12 NUTS1 region and 9 occupation dummies.

*** p<0.01, ** p<0.05, * p<0.1

Robust standard errors in parentheses.

Table 5 gives the OLS results for the hedonic wage model for all workers (columns 1a to 5a) and for men (1b to 5b). The basic coefficients of the basic hedonic wage regression without the industry dummies are significant and have the expected positive sign (columns 1 and 2). The value is greater for the fatal accidents (2.4 for the total population and 2.3 for the male population) compared to non-fatal injuries (0.012 for both populations) which is also intuitive as the compensation for deathly accidents are expected to be higher. However, in the model with the industry fixed effects (columns 3 to 5) the compensation effects become insignificant, and once industry-specific averages are introduced (columns 5) all compensation effects remain insignificant and have a negative sign.

We address these inconsistent results for risk compensation since they indicate a multicollinearity problem reported in earlier studies like Hintermann et al. (2010)[14] and Viscusi and Aldy (2003)[15]. It is hard to distinguish the premium associated with a specific industry and the risk compensation related to a particular job. By using industry dummies, Leigh (1995)[16] finds that risk variables and inter-industry differentials are correlated. This is also true for the industry averages we have included as proxies for working conditions. He concludes that the data is insufficient to produce accurate estimates of risk compensation. In the following section we use a multi-level approach using a two-step procedure as an alternative. Another possible solution to this problem, proposed by Kochi (2011)[17], is to use more detailed risk data, which would help isolate specific accident rates by including comprehensive occupation-industry pairs. However, it is not always possible to obtain a breakdown matching specific industry-occupation pairs for every country. In Turkey's

14 Hintermann, B., Alberini, A., and Markandya, A. (2010). Estimating the value of safety with labour market data: are the results trustworthy? Applied Economics, 42(9):1085 – 1100.

15 Viscusi, W. K. and Aldy J. E. (2003). The value of a statistical life: a critical review of market estimates throughout the world. Journal of Risk and Uncertainty, 27(1):5-76.

16 Leigh, J. P. (1995). Compensating wages, value of a statistical life, and inter-industry differentials. Journal of Environmental Economics and Management, 28(1):83-97.

17 Kochi, I. (2011). Endogeneity and estimates of the value of a statistical life. Environmental Economics, 2(4):17-31.

case, Polat (2014)[18] argues that gender-specific industry controls do not undermine the results for 2010 and 2011. A further limitation is that Eq. 1 estimates a labor supply model that suffers from endogeneity bias because it treats accident risks as uniform within each industry (Hwang et al., 1992).[19] This bias is unavoidable and cannot be eliminated without an indicator capable of measuring workers' individual abilities or preferences.

Additionally, there are factors and mechanisms that may countervail the CWD and that we are not able to account for. A number of studies help highlight the role of the institutional setting in determining the safety of working conditions. For instance, reduced unionization and changes in liability rules both affect the size of compensating differentials (Kim and Fishback, 1999)[20]. Morantz (2011)[21] finds that, for the mining industry, unionization leads to more frequent inspections and potential fines for safety violations. The institutional and regulatory constraints that are crucial for safer technology are not included in our analysis. Another offsetting effect comes from firms' behavior related to safety: when costly safety measures are adopted, the risk premium is reduced by the preventive technology. Assuming that accident risks can be eliminated by investing in safer technology, the trade-off between capital and risk would imply that less productive firms would hire workers willing to accept the associated risks. In this case, however, the cost of introducing safer technology and the premium associated with the risk undertaken by the workers should be equal. The equilibrium price would reinforce that risk premium should be paid according to the trade-off. In short, if productivity dispersion (wage differentials) reflects the level of firm-specific technology then more productive (with higher capital) firms should pay less to their workers for risky tasks than firms with less safe technology (Rosen, 1986). An alternative approach is to consider that the risk may be endogenous to the worker where the worker takes less risk. Guardo and Ziebarth (2019, p. 134)[22] provide evidence of the various institutional arrangements that provide incentives for the workers' risk averse behavior that also contributes to firms' profits and develop a model where "workers also supply safety and firms demand it. In turn, the firm pays higher wages for workers' provision of safety. As in the standard model, accident risk and wages will be positively correlated, but only to the extent that risk is "produced" by the firm or exogenously determined by technology. In contrast, when safety is produced by workers, our model predicts a negative relationship between the individual accident risk and wages. To the extent that workers' provision of safety prevents accidents, riskier jobs then appear safer than they actually are."

Unfortunately, due to data constraints, we are limited in estimating theses different mechanisms that may underlie the negative compensation. Given the prevalence of poor working conditions

18 Polat, S. (2014). Wage compensation for risk: The case of Turkey. Safety Science, 70:153-160.

19 Hwang, H.-S., Reed, W. R., and Hubbard, C. (1992). Compensating wage differentials and unobserved productivity. Journal of Political Economy, 100(4):835-858.

20 Kim, S.-W. and Fishback, P. V. (1999). The impact of institutional change on compensating wage differentials for accident risk: South Korea, 1984-1990. Journal of Risk and Uncertainty, 18(3):231-248.

21 Morantz, A. (2011). Does unionization strengthen regulatory enforcement-an empirical study of the mine safety and health administration. NYDJ Jegis. & Pub. Pol'y, 14:697.

22 Guardado, J. R., and Ziebarth, N. R. (2019). Worker investments in safety, workplace accidents, and compensating wage differentials. International Economic Review, 60(1):133-155.

on Turkey's labor market, in the following section we adopt an alternative estimation strategy in order to address the multicollinearity issue and improve our results.

3. Two-Step Procedure

Industry wage differentials may not only reflect risk compensation but also industry-specific technology differences that are hard to identify with limited (pooled cross-sectional) data, although a multi-level approach could offer one improvement through a two-step procedure used to model hierarchical structures (Hanushek, 1974[23]; Saxonhouse, 1976[24]). Bryan and Jenkins (2016)[25] discuss the effectiveness of a two-step procedure to isolate the source of variation by multi-leveling the estimation.

$$\ln(w_{ijt}) = \alpha + \beta X_{ijt} + q_{jt} + \varepsilon_{ijt} \quad (2)$$

$$\hat{q}_{jt} = \delta I_{jt} + \mu p_{jt} + \eta_{ijt} \quad (3)$$

In a similar vein we regress the raw wage differentials at the industrial level (q_{jt}) obtained in the first step (Eq.2) on the proxy variables that we think measure working conditions and environment (second stage). In the second step (Eq.3), the estimated industrial wage differentials ($\hat{q}_{jt}$) are regressed on accident risks and indicators such as industry averages (factor-weighted) proxying for unobserved risk (I_{jt}) and injury risk (p_{jt}) as in Eq. 1. The second stage also controls for the fixed effects for year and industry. The two-step procedure is thus expected to provide improved results in the presence of multi-collinearity correlation bias where the standard hedonic wage regression may be unable to differentiate industry wage differentials from the compensating premiums related to specific working conditions at the industry level (23 industries over a five-year period yields 115 number of observations).

We do not present the estimation results from the first-step regressions since they do not differ significantly from the expected dummy variables for industry-by-year pairs. Table 6 displays the results of the second stage with various specifications. All types of injuries are insignificant and have a negative sign (except models 1a and 1b). Overall the results suggest that the differentials are mainly explained by working conditions other than injury risk. Average years of tenure is a proxy for workforce turnover and firm-specific knowledge accumulation. High turnover may be a choice (good conditions) or a constraint (poor conditions); it may also capture the sector-specific skill in which case turnover is expected to be low. This variable is also insignificant across specifications.

23 Hanushek, E. A. (1974). Efficient estimators for regressing regression coefficients. The American Statistician, 28(2):66-67.

24 Saxonhouse, G. R. (1976). Estimated parameters as dependent variables. The American Economic Review, 66(1):178-183.

25 Bryan, M. L. and Jenkins, S. P. (2016). Multilevel modelling of country effects: a cautionary tale. European Sociological Review, 32(1):3-22.

The most significant covariates are working hours and the share of workers with post-secondary education, for all populations. As already mentioned, the role of longer working hours is important and needs further discussion. Low pay (less productive) sectors are associated with longer working hours[26]. The legal framework in Turkey allows firms to determine the working hours of each worker during a working week. According to the World Bank's Doing Business Index,[27] the standard number of working hours in a day (Article 63, Labor Law; 2003) is restricted to eleven hours in Turkey, which is not common in most OECD countries, as the usual upper limit in practice is eight hours per day. Working hours commonly exceed the standard 45 hours per month[28] (without compensation) in both the formal and informal sectors in Turkey, as mentioned above.

Education is another factor that is likely to provide information regarding productivity. We have used alternative measurements such as the share of poorly educated population or average years of education. The share of workers with post-secondary education provided more significant results probably due to the fact that there is greater heterogeneity among this population across industries. As expected the sign is positive, its impact is more significant with a larger magnitude across specifications for the male population. This finding is line with Turkey's labor market structure: female labor participation increases with the level of education, such that wage differentials among the women are relatively lower compared to men. Men participate more at all levels of education and their wage differentials are larger. Other covariates are significant for the male population only in specifications including all covariates (10b, 11b and 12b). The informal worker ratio is significant and negative. This implies that industries with a larger share of informal employment are less productive. On-the-job search is included to control for job dissatisfaction also affects wage compensation negatively.

26 Messenger et al. (2007, p.123) argue that, in developing countries "the relationship between working time and productivity is weak and increases in output are often fuelled by overtime work." Messenger, J. C., Lee, S., and McCann, D. (2007). Working time around the world: Trends in working hours, laws, and policies in a global comparative perspective. Routledge.

27 World Bank. Doing Business Index. http://www.doingbusiness.org/data/exploretopics/employing-workers

28 The minimum wage is paid on a monthly basis. Polat and Ulus (2014) argue that monthly wage dispersion provides evidence that minimum wage setting is binding in the formal sector whereas hourly wage dispersion is less bound by minimum wage legislation. Polat, S. and Ulus, M. (2014). Hours worked, wages and productivity. Mimeo, Department of Economics, Galatasaray University.

Table 6: Two-step procedure (second stage results, pooled cross-section, 2013-17)

	All workers											
	(1a)	(2a)	(3a)	(4a)	(5a)	(6a)	(7a)	(8a)	(9a)	(10a)	(11a)	(12a)
Fatal injury per 10000 worker	0.238							-0.685			-1.205	-1.192
	(1.096)							(1.063)			(1.118)	(1.128)
Non-fatal injury per 100 worker		-0.007							-0.001	-0.007		-0.007
		(0.010)							(0.011)	(0.010)		(0.011)
Average regular working hours			-0.014**					-0.007	-0.006	-0.007	-0.009*	-0.009
			(0.006)					(0.006)	(0.007)	(0.006)	(0.005)	(0.006)
Post-secondary worker ratio				0.380*				0.338	0.333	0.363	0.379*	0.371
				(0.193)				(0.226)	(0.231)	(0.227)	(0.222)	(0.227)
Average years of job tenure					0.009					0.006	0.006	0.006
					(0.010)					(0.011)	(0.010)	(0.011)
Informal worker ratio						-0.031		-0.068	-0.080	-0.111	-0.095	-0.090
						(0.126)		(0.127)	(0.127)	(0.124)	(0.122)	(0.124)
On-the-job search ratio							-0.420			-0.648	-0.652	-0.728
							(0.456)			(0.589)	(0.571)	(0.586)
Constant	0.007	0.025	0.768**	-0.038*	-0.043	0.015	0.018	0.381	0.310	0.361	0.479	0.493
	(0.015)	(0.027)	(0.333)	(0.022)	(0.054)	(0.027)	(0.012)	(0.366)	(0.410)	(0.377)	(0.319)	(0.333)
Year effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	115	115	115	115	115	115	115	115	115	115	115	115
R-squared	0.926	0.927	0.931	0.937	0.928	0.926	0.928	0.938	0.937	0.942	0.943	0.943

	Men											
	(1b)	(2b)	(3b)	(4b)	(5b)	(6b)	(7b)	(8b)	(9b)	(10b)	(11b)	(12b)
Fatal injury per 10000 worker	0.300							-0.542			-1.109	-1.120
	(1.098)							(1.000)			(0.933)	(0.934)
Non-fatal injury per 100 worker		-0.003							0.004	-0.005		-0.005
		(0.011)							(0.012)	(0.009)		(0.010)
Average regular working hours			-0.018**					-0.010	-0.009	-0.008	-0.010*	-0.010*
			(0.007)					(0.007)	(0.007)	(0.006)	(0.006)	(0.006)
Post-secondary worker ratio				0.434**				0.383*	0.385	0.466**	0.476**	0.474**
				(0.197)				(0.227)	(0.234)	(0.230)	(0.221)	(0.223)
Average years of job tenure					0.009					0.008	0.007	0.007
					(0.008)					(0.009)	(0.008)	(0.008)
Informal worker ratio						-0.051		-0.179	-0.205	-0.268*	-0.255**	-0.241*
						(0.131)		(0.125)	(0.139)	(0.136)	(0.126)	(0.128)
On-the-job search ratio							-0.596			-0.789*	-0.836*	-0.893*
							(0.394)			(0.466)	(0.467)	(0.471)
Constant	0.001	0.010	0.997**	-0.047**	-0.053	0.014	0.016	0.540	0.487	0.433	0.569*	0.564*
	(0.017)	(0.026)	(0.403)	(0.021)	(0.044)	(0.025)	(0.010)	(0.398)	(0.408)	(0.375)	(0.332)	(0.338)
Year effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	115	115	115	115	115	115	115	115	115	115	115	115
R-squared	0.913	0.913	0.921	0.927	0.915	0.913	0.916	0.930	0.930	0.939	0.940	0.940

*** p<0.01, ** p<0.05, * p<0.1

Robust standard errors in parentheses.

4. Conclusion

We tested the compensating wage differentials hypothesis for the case of Turkey, using official industrial occupational injury figures provided by Turkey's Ministry of Labor and Social Security based on the records of Social Security Institution, and data from Household Labor Force Surveys for wages and for the construction of industry specific variables, for the 2013-2017 period. The compensating wage differential (CWD) hypothesis predicts that workers in occupations with riskier, less safe, environments are compensated, such that wages in riskier jobs are expected to be higher (risk premium).

The standard hedonic wage equation for fatal and non-fatal occupational injury risk at the industrial level gave inconsistent results. In particular, the positive risk compensation predicted by the CWD hypothesis disappeared after controlling for industry effects. To provide an alternative estimation, we followed a two-step procedure by regressing injury risk and industry-specific averages on the industry wage differentials. Again, we find that the impact of the injury risk on the industry wage differentials is insignificant, and contrary to the CWD, its sign is negative.

We further find that longer working hours, share of informal employment and on-the-job search (as a proxy for job dissatisfaction) in Turkey are associated with lower wage compensation at the industry level. We therefore argue that compensation for risk does not explain wage differentials, even when sector-specific factors are included to control for productivity differences. These findings reinforce the argument that labor segmentation theory is more relevant, considering that Turkey's labor market institutions perform relatively poorly, that working hours are longer and that its informal sector has a larger share than in other OECD countries.

Finally, although multi-leveling improves the estimation compared to the standard hedonic regression, these results should be interpreted cautiously as further research is needed to address the shortcomings of this study. In particular, greater than two-digit disaggregation of sectors may refine the relationship between low pay and poor working conditions more clearly, and allow to consider a larger number of sectors beyond the manufacturing sector. Improvement in data collection would also contribute to the analysis, through records and surveys that would provide more detailed information on firms and informal workers in relation with occupational injuries.

References

BİLİR, N. (2016). Occupational Safety and Health Profile: Turkey. ILO.

BRYAN, M. L. and Jenkins, S. P. (2016). Multilevel modelling of country effects: a cautionary tale. European Sociological Review, 32(1):3-22.

EUROFOUND. European Working Conditions Surveys. https://www.eurofound.europa.eu/data/european-working-conditions-survey

EUROPEAN UNION (2012) European Statistics on Accidents at Work (ESAW). Summary methodology. Eurostat Methodologies and Working papers.

GUARDADO, J. R., and Ziebarth, N. R. (2019). Worker investments in safety, workplace accidents, and compensating wage differentials. International Economic Review, 60(1):133-155.

HAMALAINEN, P. (2009). The effect of globalization on occupational accidents. Safety Science, 47(6):733-742.

HAMALAINEN, P., Leena Saarela, K., and Takala, J. (2009). Global trend according to estimated number of occupational accidents and fatal work-related diseases at region and country level. Journal of Safety Research, 40(2):125-139.

HANUSHEK, E. A. (1974). Efficient estimators for regressing regression coefficients. The American Statistician, 28(2):66-67.

HINTERMANN, B., Alberini, A., and Markandya, A. (2010). Estimating the value of safety with labour market data: are the results trustworthy? Applied Economics, 42(9):1085 – 1100.

HWANG, H.-S., Reed, W. R., and Hubbard, C. (1992). Compensating wage differentials and unobserved productivity. Journal of Political Economy, 100(4):835-858.

ILOSTAT – "Safety and health at work" statistics, https://www.ilo.org/ilostat/

KIM, S.-W. and Fishback, P. V. (1999). The impact of institutional change on compensating wage differentials for accident risk: South korea, 1984-1990. Journal of Risk and Uncertainty, 18(3):231-248.

KOCHI, I. (2011). Endogeneity and estimates of the value of a statistical life. Environmental Economics, 2(4):17-31.

KRUEGER, A. B. and Summers, L. H. (1988). Efficiency wages and the inter-industry wage structure. Econometrica. Journal of the Econometric Society, 259-293.

LEIGH, J. P. (1995). Compensating wages, value of a statistical life, and inter-industry differentials. Journal of Environmental Economics and Management, 28(1):83-97.

MESSENGER, J. C. (2011). Working time trends and developments in Europe. Cambridge Journal of Economics, 35(2):295-316.

MESSENGER, J. C., Lee, S., and McCann, D. (2007). Working time around the world: Trends in working hours, laws, and policies in a global comparative perspective. Routledge.

MORANTZ, A. (2011). Does unionization strengthen regulatory enforcement-an empirical study of the mine safety and health administration. NYDJ Jegis. & Pub. Pol'y, 14:697.

OECD (2006). Society at a Glance. OECD Social lndicators. Organisation for Economic Co-operation and Development.

POLAT, S. (2014). Wage compensation for risk: The case of Turkey. Safety Science, 70:153-160.

POLAT, S. and Ulus, M. (2014). Hours worked, wages and productivity. Mimeo, Department of Economics, Galatasaray University.

ROSEN, S. (1986). The theory of equalizing differences. Handbook of Labor economics, 1:641-692.

SAXONHOUSE, G. R. (1976). Estimated parameters as dependent variables. The American Economic Review, 66(1):178-183.

TOKSÖZ, G. (2008). Decent work country report – Turkey. International Labour Organization.

VISCUSI, W. K. and Aldy J. E. (2003). The value of a statistical life: a critical review of market estimates throughout the world. Journal of Risk and Uncertainty, 27(1):5-76.

WORLD BANK. Doing Business Index. http://www.doingbusiness.org/data/exploretopics/employing-workers