

Supplementary Material

Preliminary results of invisible employment estimation

1. Cluster analysis (step 2)

The first step of estimating invisible employment in the forestry and logging sub-sector begins with clustering countries based on their similarities across country economic performance, type of wood and climatic attributes. The hierarchical dendrogram (Figure S1) provides guidance on the possible number of clusters to retain. Our dendrogram reveals that 4 to 5 country groups would be the optimal solution. Subsequently, the Partitioning Around Medoids is employed to determine the final cluster solution and identify country memberships. The silhouette index of each country is plotted in decreasing order by the cluster (Figure S2). The size of a cluster can be visualised through the thickness of the silhouette plot and distinguished by different colours. In our case, four is the optimal number of clusters in comparison to the other solutions. The overall average silhouette width is maximised at 0.76 and implies that a strong clustering structure is found for the 172 countries of our analysis. In view of each cluster, most of the silhouette coefficients of countries in clusters 1 (CL1) and 2 (CL2) are close to one, indicating that the objects in these clusters are distant enough from the neighbouring clusters. The high average silhouette widths of CL1 and CL2 make these two clusters more pronounced compared to the other clusters.

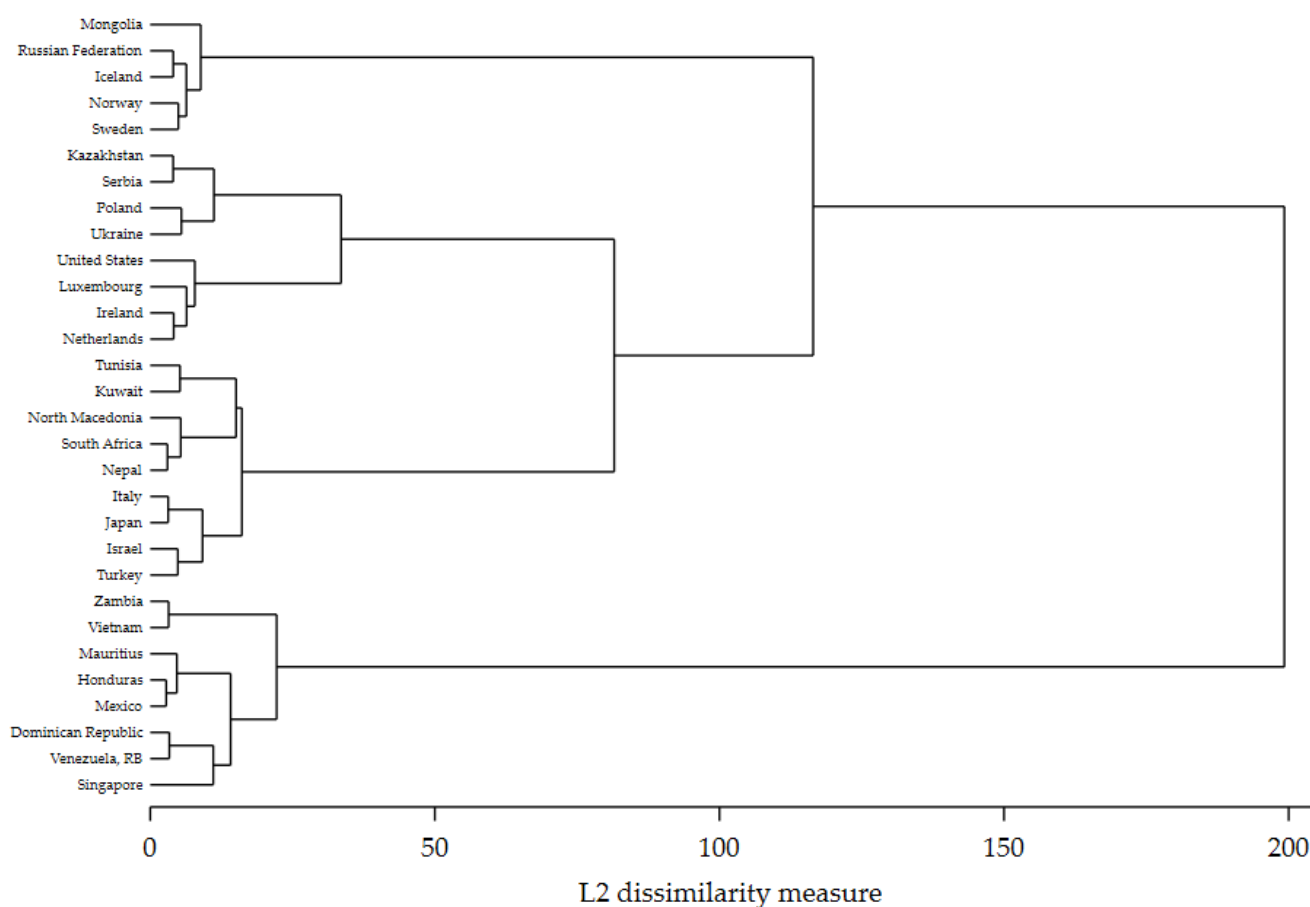


Figure S1. Hierarchical dendrogram.

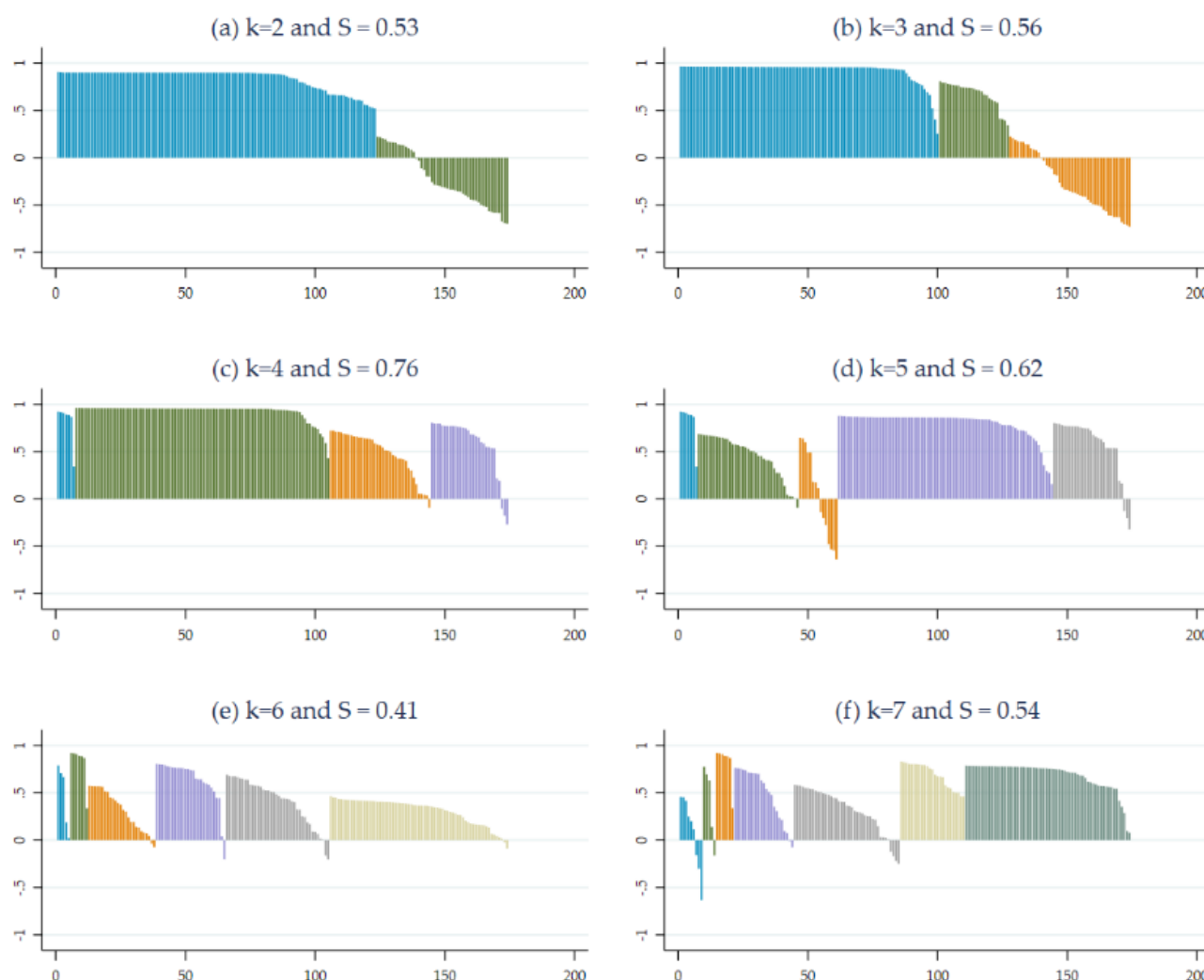


Figure S2. Silhouette width for all possible cluster solutions.

Notes: k and S stand for cluster solution and average silhouette widths of all countries, respectively. Axis x represents country index. The vertical line represents each country, and its width indicates the strength of cluster membership. (a), (b), (c), (d), (e) and (f) refer to silhouette width results of cluster is equal to 2, 3, 4, 5, 6 and 7, respectively.

The F-statistic of one-way analysis of each attribute variable reveals that there is a statistically significant difference in the mean of at least two country clusters (Table S1). Post-hoc pairwise comparisons of mean (unequal variances) are further performed to check the difference between two cluster in all attribute dimensions. The preliminary results show significant difference for any two clusters at least in one attribute variable (Table S2). Countries in each cluster are well homogenous, and heterogeneity exist between clusters as shown by the average silhouette width, ANOVA and pairwise comparison tests.

Figure S3 presents the global overview of country clusters, distribution of per capita GDP and share of non-coniferous roundwood removal in each group. CL1 is the smallest cluster including high- and middle-income nations of the boreal zone. Here, the major production is soft roundwood. CL2 contains 98 countries mainly located in Africa, Americas, Asia with high share of tropical forest areas and non-coniferous roundwood production. The average GDP per capita of cluster 2 is the lowest of all clusters, implying that this cluster contains most of low-income and developing nations. Cluster 3 (CL3) consists of high-income countries in Europe. It contains the largest share of temperate forest area

of all clusters. Cluster 4 (CL4) encompasses most sub-tropical forest areas, consisting of countries in Western and Central Asia as well as middle-income European countries.

Table S1. One-way ANOVA test of each cluster variable.

Attribute variables	ANOVA Test		Bartlett's Test for equal variances	
	(F-Statistics and p-value)		Chi-square	p-value
Per capita GDP	(F (3,170) = 29.01,	$p = 0.000$)	81.8	0.000
Share of boreal forest area	(F (3,170) = 1113.1,	$p = 0.000$)	94.1	0.000
Share of tropical forest area	(F (3,170) = 4019.86,	$p = 0.000$)	161.6	0.000
Share of sub-tropical forest area	(F (3,170) = 385.66,	$p = 0.000$)	288.6	0.000
Share of temperate forest area	(F (3,170) = 564.08,	$p = 0.000$)	381.7	0.000
Share of non-coniferous roundwood	(F (3,170) = 73.6,	$p = 0.000$)	43.8	0.000

Table S2. Pairwise comparisons of means (unequal variances): Games and Howell adjusted P value.

Pair of clusters	Per capita GDP	Boreal	Tropical	Sub-tropical	Temperate	Non-coniferous
CL2 vs CL1	0.048	0.000	0.000	0.225	0.128	0.000
CL3 vs CL1	0.520	0.000	0.605	0.051	0.000	0.000
CL4 vs CL1	0.086	0.000	0.205	0.000	0.979	0.000
CL3 vs CL2	0.000	0.180	0.000	0.082	0.000	0.000
CL4 vs CL2	0.092	0.751	0.000	0.000	0.008	0.012
CL4 vs CL3	0.003	0.375	0.302	0.000	0.000	0.000

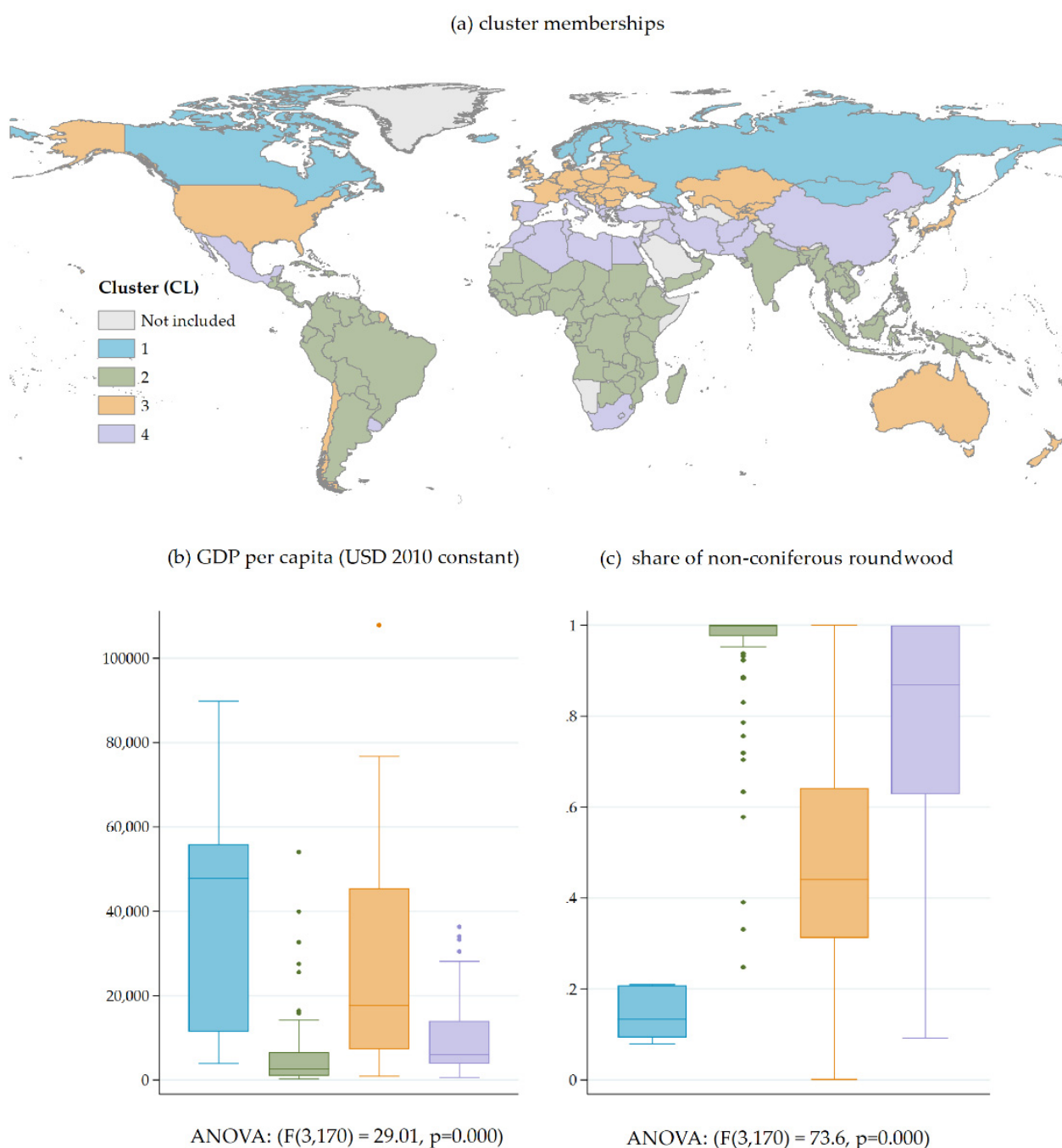


Figure S3. Country groups and attribute variables.

Note: Total number of countries is 172, dividing into 7, 96, 39 and 30 countries in the cluster 1, 2, 3 and 4, respectively. (a) overview of cluster membership, (b) distribution of GDP per capita by cluster and (c) distribution of share of non-coniferous roundwood in total roundwood removals

2. Identifying countries with invisible employment (step 3)

The level of labour productivity is used as criterion to identify countries where informal and subsistence employment is likely not captured in the official statistics (see also: sub-section 3.2.2 in the article). Unweighted and weighted average of labour productivities per cluster are presented in Table S3. Weighted labour productivity of roundwood is considerably low in CL2 and CL4, mostly referring to low and lower middle-income de-

veloping countries. The relatively high unweighted labour productivity from CL2 however, indicates that productivity rates are most likely not realistic for some countries, given the level of technological development and type of roundwood that is attributed to this cluster. Reversely, labour productivity for industrial roundwood in CL2, using the same total visible employment quantity in the forestry sub-sector as a divisor, is likely plausible. This implies that the number of persons employed in many countries, particularly those of CL2, still remain underreported in the official statistics.

Table S3. Unweighted and weighted labour productivity (m³ per person in FTE), by cluster.

Cluster (CL)	N	Total roundwood removals		Industrial roundwood	
		Unweighted	Weighted	Unweighted	Weighted
1	7	1932	2069	1755	1925
2	52	2108	225	301	56
3	35	1098	897	776	703
4	17	408	285	166	117

Notes: N refers to number of countries in each cluster.

Table S4 presents country labour productivity calculated from the production and visible employment statistics as well as the upper thresholds at the cluster level. Australia and New Zealand are firstly detected as outliers as their labour productivity levels are greater than the first upper threshold of the respective cluster. However, FAO revealed that both countries hold similar high levels of labour productivity [1], which is confirmed by the calculated numbers of this study. Hence, we considered the high labour productivity rates for both cases as plausible.

Table S4. Identified country cases and labour productivity thresholds.

country	Region	cluster	Labour productivity (m ³ /person FTE)			Share woodfuel (%)	2 nd upper threshold ²	Country cases
			Roundwood	Industrial roundwood	1 st upper threshold ¹			
Mongolia	Asia	1	12	3	4254	79	Not applicable	
Iceland	Europe	1	30	23		25		
Norway	Europe	1	2097	1749		17		
Finland	Europe	1	2440	2126		13		
Russia	Europe	1	2720	2522		7		
Canada	Americas	1	2929	2858		2		
Sweden	Europe	1	3299	3005		9		
Kenya	Africa	2	1005	38	2789	96	1069 ⁴	Yes
Bolivia	Americas	2	1131	318		72		Yes
Honduras	Americas	2	1225	70		94		Yes
Bangladesh	Asia	2	1325	20		98		Yes
Mozambique	Africa	2	1336	142		89		Yes
Zimbabwe	Africa	2	1345	88		93		Yes
Botswana	Africa	2	1544	202		87		Yes
Madagascar	Africa	2	1757	21		99		Yes
Argentina	Americas	2	1786	1311		27		Yes
Brazil	Americas	2	2600	1407		46		Yes
Jamaica	Americas	2	2600	582		78		Yes
Indonesia	Asia	2	2942	1781		39		Yes
Sudan	Africa	2	3120	221		93		Yes
Gambia	Africa	2	3250	437		87		Yes

Philippines	Asia	2	3262	815	2789	75	1069 ⁴	Yes
Nigeria	Africa	2	3763	501		87		Yes
Tanzania	Africa	2	4988	526		89		Yes
Malawi	Africa	2	7162	1435		80		Yes
Burundi	Africa	2	9200	868		91		Yes
Zambia	Africa	2	10773	671		94		Yes
Ghana	Africa	2	13059	671		95		Yes
Sierra Leone	Africa	2	21062	441		98		Yes
Other 31 countries ³		2	< 950	< 611				
Rep. of Korea	Asia	3	20	18	2147	10	4140 ⁵	
Kazakhstan	Asia	3	20	6		71		
Kyrgyzstan	Asia	3	24	5		80		
Bulgaria	Europe	3	214	117		45		
Hungary	Europe	3	247	132		47		
Ukraine	Europe	3	297	132		55		
Rep. of Moldova	Europe	3	332	12		96		
Slovakia	Europe	3	354	304		14		
Japan	Asia	3	383	335		12		
Switzerland	Europe	3	384	238		38		
Romania	Europe	3	466	312		33		
United Kingdom	Europe	3	473	391		17		
Belarus	Europe	3	478	280		41		
Chile	Americas	3	515	376		27		
Poland	Europe	3	548	478		13		
Lithuania	Europe	3	570	389		32		
Luxembourg	Europe	3	609	494		19		
Croatia	Europe	3	651	430		34		
Latvia	Europe	3	744	662		11		
Denmark	Europe	3	815	391		52		
Austria	Europe	3	844	604		28		
Serbia	Europe	3	893	161		82		
Netherlands	Europe	3	1071	428		60		
Belgium	Europe	3	1230	1027		16		
Ireland	Europe	3	1257	1153		8		
Czech Republic	Europe	3	1269	1094		14		
Estonia	Europe	3	1369	945		31		
Slovenia	Europe	3	1427	1050		26		
Portugal	Europe	3	1476	1382		6		
France	Europe	3	1834	895		51		
Germany	Europe	3	1980	1310		34		
Bhutan	Asia	3	2924	70		98		Yes
New Zealand	Oceania	3	3328	3328		0		
Australia	Oceania	3	3546	3068		13		
USA	Americas	3	5830	5129		12		Yes

Cyprus	Asia	4	14	4	1030	72	1069 ⁴	
Israel	Asia	4	27	25		7		
Lesotho	Africa	4	45			100		
Iran	Asia	4	53	50		7		
Turkey	Asia	4	95	76		20		
Morocco	Africa	4	95	6		94		
South Africa	Africa	4	170	94		45		
Algeria	Africa	4	217	3		98		
China	Asia	4	287	137		52		
Mexico	Americas	4	301	38		87		
Italy	Europe	4	328	52		84		
North Macedonia	Europe	4	331	53		84		
Tunisia	Africa	4	344	27		92		
Georgia	Asia	4	355	70		80		
Iraq	Asia	4	536	179		67		
Spain	Europe	4	649	505		22		
Uruguay	Americas	4	1615	1283		21		Yes
Pakistan	Asia	4	1884	228		88		Yes

Notes: 1-The first upper threshold is determined using 2.5 times Median Absolute deviation based on labour productivity of roundwood from cluster's country members. 2-The second upper threshold is used to cross-check countries that are not detected as greater than the first upper threshold. It is the weighted labour productivity of total roundwood removal at the cluster level, excluding countries detected as outliers from the first-round assessment. 3-Detailed information on these 31 countries can be provided upon request. 4-Labour productivity threshold at 1069 m³ per FTE is at two times weighted labour productivity of cluster 3. 5- Labour productivity threshold at 4140 m³ per FTE is at two times weighted labour productivity of cluster 1.

We continue to check countries that are not detected as outlying cases by comparing their reported labour productivity with the weighted average labour productivity of the other clusters and available literature references. Whiteman et al. [2] revealed that boreal countries have the highest levels of labour productivity, followed by countries in the temperate, sub-tropical and tropical climatic domains. According to geographical region, after Nordic countries, Western Europe, the Baltic states, Brazil and Chile hold the next highest levels of roundwood labour productivity, followed by developing countries [1]. Hence, we assessed labour productivity of countries in CL2 by comparing them with the weighted labour productivity of CL3. Subsequently, labour productivity of roundwood production from Argentina, Brazil, Bolivia, Jamaica, Botswana, Mozambique, Zimbabwe, Honduras, Kenya, Bangladesh and Madagascar (n=11) are detected as implausible. They are at least twofold higher than the weighted labour productivity of CL3, which covers most of the Western European nations. The share of wood fuel production in the detected countries is above 70 per cent of total roundwood production, except for Brazil and Argentina. But collecting fuelwood is likely to be less productive in developing countries due to poor mechanization and means of transportation [3]. This also holds true for countries with only moderate wood fuel scarcity [4]. For the case of Brazil and Argentina, labour productivity for harvesting industrial roundwood is relatively high compared to Western European countries of CL3. Whiteman et al. [2] showed that labour productivity of forestry and logging for the case of Brazil is closer to the global average, ranging from 500 – 750 cubic metre per employee FTE during the period 2000 to 2010. Subsequently, we treated the aforementioned 11 countries as outlying cases as well.

For the case of CL3 and CL4, Bhutan, Pakistan, Uruguay, United States of America (USA) are identified to have invisible employment. The labour productivity levels of roundwood removals of those countries are above the first upper threshold and cannot be plausibly explained by previous studies. In case of CL3 and CL4, no countries are further

detected having labour productivity rates higher than the weighted level of the reference clusters. Eventually, 26 countries that already reported employment statistics to FAO are identified as country cases, where invisible employment estimation needs to be estimated (Table S5). Additionally, invisible employment estimations will be carried out in 59 countries that did not officially report employment statistics to FAO but reported production quantities of roundwood removals.

Table S5. Number of country cases by cluster.

Cluster	Countries for invisible employment estimation, when		Countries with plausible labour productivity rates
	statistics available	statistics missing	
1	0	0	7
2	22	43	31
3	2	4	33
4	2	12	16
Global	26	59	87

In the 22 countries with implausible productivity rates in CL2, the average proportion of wood fuel production is 70 per cent of total roundwood removals. This could be the reason for implausible productivity rates. In line with [5], it can be expected that there is invisible employment originating from wood fuel harvesting. Nevertheless, it remains unclear whether there could be also unrecorded employment of industrial roundwood in these countries. Hence, we assess labour productivity of industrial roundwood by applying employment statistics of forestry sub-sector, as a divisor. The highest average labour productivity using motor-manual cutting at 3.5 m³ per man-day was observed in Tanzania [6]. This value is converted to per unit of a person in FTE and set as the highest average productivity rate to filter countries in CL2 with implausible industrial roundwood productivity. As a result, Brazil, Argentina, Indonesia and Malawi, are identified to underreport employment numbers for wood fuel and partly for industrial roundwood production. For the remaining 18 countries from CL2, invisible employment is estimated solely from wood fuel production. For the case of CL3 and CL4, invisible employment estimates for Bhutan and Pakistan would be mainly derived from wood fuel collecting activities according to the production statistics. In the USA and Uruguay, however, industrial roundwood holds the large share of total roundwood removals.

3. Labour productivity references (step 4)

Table S6 presents the labour productivity rates derived for each cluster. Regarding CL2, available information and accessible empirical data allow us to derive labour productivity rates disaggregated by logging and collecting woodfuel activities. The considered labour productivity references for industrial roundwood production ranges from 174 – 910 m³ per person FTE [6,7]. Wood fuel removals generally include wood harvested for fuel (firewood) and wood used for charcoal production [8]. To increase the accuracy of our estimates, we calculated labour productivity references of firewood and wood for making charcoal separately. In the case of firewood production, labour productivity references are generated from empirical household data and published studies. Based on information from an empirical survey in Zambia, the average labour productivity of collecting firewood is 10 m³ per person in FTE (We firstly calculated labour productivity in the unit of volume (m³) per hour per person. After that, we converted it to the unit of a person in FTE applying 2080 hours per year.), and is set as the lower bound value in our study. The average rate of 118 hours to collect one cubic metre of wood fuel, as reviewed by FAO [5], is converted to 18 m³ per person FTE and is employed as the upper bound reference for CL2 (Table S6).

The labour productivity of collecting wood for making charcoal is estimated based on the same household survey data from Zambia. The total weight of charcoal in metric tonnes is derived from Kazungu et al. [9] and factored by 6, resulting in the under-bark volume in cubic metres of roundwood used for charcoal. Similar to firewood, labour productivity rates are estimated as the respective volume of roundwood for making charcoal per person in FTE. A confidence interval of mean of 75 to 168 m³ / FTE is employed as lower and upper bound productivity references of collecting wood for making charcoal for identified countries in CL2.

Since disaggregate productivity references for industrial roundwood and wood fuel production are not available for the case of CL3 and CL4, labour productivity of total roundwood removal activities is used as a proxy. Accordingly, the labour productivity references are primarily derived from plausible country cases. For instance, Bhutan (BTN), Uzbekistan (UZB), Tajikistan (TJK) are identified as country cases. The labour productivity references used for invisible employment estimation in these three countries are derived from the available plausible countries in CL3 i.e. Kazakhstan and Kyrgyzstan. Both reported similar shares of wood fuel production and are located in Asia..

Though USA belongs to CL3, the level of technology used in the forestry and type of operations is approximately the same as in Canada [10]. In both countries, labour productivity is relatively high. The annual labour productivity trend between 2000 – 2011 was stagnating and ranged 2500 – 3000 m³ per employee FTE [1]. Accordingly, the roundwood productivity rate in Canada is used as the upper bound value for the case of USA, whereas the lower bound is extracted from available literature of countries belonging to the same cluster (here: Japan). If more than two countries with plausible labour productivity rates are available, the confidence interval for mean based on these countries is applied as the lower- and upper bound references. For instance, labour productivity references for countries in CL 4 that have a share of wood fuel removals of more than 70 per cent, are based on the confidence interval for mean of eight plausible countries in the same cluster, respectively.

Table S6. Labour productivity references (m³ per person in FTE), by cluster.

CL	Product / (identified country with invisible employment)	Bound	Source	Geographical Area used as references in each cluster	Extracted value / Notes	Labour Productivity (m ³ /FTE)
2	Industrial Roundwood	Lower	[7]	Laos	174 m ³ /FTE (Number of employees includes forestry activity)	174
		Upper	[6]	Tanzania	Highest average productivity from chainsaw cutting 3.5 m ³ per man-day	910
	Firewood	Lower	[9]*	Zambia	Average value based on 624 households ⁷	10
		Upper	[5]	Latin America, Africa, Asia and Oceania	106, 110 and 139 hours required to collect m ³ firewood, average at 118 hours is applied	18
	Wood for charcoal	Lower	[9]*	Zambia	CI of mean based on 170 households ⁸	75
		Upper	[9]*			168
3	Roundwood (USA)	Lower	[11]	Japan	4.4 m ³ per man-day to produce logs through the purchases of stumpage	1144
		Upper	**	Canada	Total roundwood per person in FTE	2929
	Roundwood (BTN, UZB, TJK)	Lower	**	Kazakhstan	Only two plausible countries hold similar	20
		Upper	**	Kyrgyzstan	share of WF and located in Asia	24

	Roundwood (MNE)	Lower	**	Rep. of Moldova	Only two plausible countries hold similar share of WF and located in Europe	332
		Upper	**	Serbia		893
	Roundwood (BIH)	Lower	**	Plausible European	CI of mean based on 7 countries	604
		Upper	**	countries CL3		1305
4	Roundwood (URY)	Lower	**	Turkey	Only two plausible countries hold similar share of WF	95
		Upper	**	Spain		649
	Roundwood (AFG, LBN)	Lower	**	South Africa	Only two plausible countries hold similar share of WF	170
		Upper	**	China		287
	Roundwood (11 countries, WF > 70 %)	Lower	**	Plausible countries	CI of mean based 8 countries	103
		Upper	**	CL4		401

Notes: 1.* Using the survey data from the respective reference for computation of labour productivity references. 2.** Own calculations based on plausible country cases in the respective clusters. The countries used for computing labour productivity references are selected based on the share of wood fuel in total roundwood removals and geographical region. 3. 2080 hours per year is used as a proxy of 1 full-time equivalent. 4. Confidence Interval for mean is at a 99% confidence level indicating there is 99 per cent chances that this range contains the true mean of labour productivity rate. 5. Country codes: USA-United State of America, BTN-Bhutan, UZB- Uzbekistan, TJK- Tajikistan, MNE- Montenegro, BIH- Bosnia and Herzegovina, URY- Uruguay, AFG- Afghanistan, LBN- Lebanon 6. WF stands for wood fuel. 7. Data covers 180, 229 and 215 households in Copperbelt, Eastern and North Western provinces, Zambia. 8. Data covers 85, 42 and 43 households in Copperbelt, Eastern and North Western provinces, Zambia.

4. Derived estimation procedure (step 5)

The estimation procedure is categorized into two main groups, i.e. countries with and without official employment statistics on the basis of identified country cases and available labour productivity references (Table 5). In principle, invisible employment can be estimated based on the amount of total roundwood removals and the amount of time spent for felling and collecting the respective amount of roundwood. Total roundwood removals compiled by FAO is an aggregated quantity of industrial roundwood (wood in rough) and wood fuel [8]. For countries in CL2, the availability of disaggregated labour productivity references allows us to estimate invisible employment numbers further distinguished by persons who engaged in harvesting of industrial roundwood and wood fuel.

Wood fuel includes wood harvested for fuel and wood that will be used for charcoal production [8], which labour productivity rates can be dissimilar. Therefore, the share of firewood removals and wood used for making charcoal is computed based on FAOSTAT data of total wood fuel removals (item code 1864) and wood charcoal production (item code 1630). The average wood charcoal production from 2014 to 2016 in the unit of metric tonnes (WC) is converted to volume of roundwood used in cubic metre (RW_{wc}) using a factor of 6 based on [8].

$$RW_{wc} = WC * 6 \quad (3)$$

The proportion of roundwood for producing charcoal ($ShareRW_{wc}$) in total woodfuel removals (WF_{total}) is calculated as.

$$ShareRW_{wc} = \frac{RW_{wc}}{WF_{total}} \quad (4)$$

The remainder of total wood fuel removals is attributed as the share of firewood ($ShareRW_{fw}$) for cooking, heating or power production. Wood fuel removal quantities are further factored by the share of roundwood for charcoal production and share of firewood harvesting during the invisible employment estimating procedure.

The number of persons in invisible employment in the forestry sub-sector for countries in CL2 are computed corresponding to procedure I, II and IV presented in Table S7. Procedure I is applied to 4 countries in CL2, in which labour productivities of roundwood

and industrial roundwood are greater than the threshold and cannot be plausibly explained. Total invisible employment estimates of these four countries are mostly originating from wood fuel collection activities and partly from felling of industrial roundwood. Invisible employment estimation in procedure II is a function of collecting firewood and wood for making charcoal. This approach is applied to countries where the officially reported visible employment data refer to industrial roundwood production only. The criteria in this case follows the rationale that labour productivity of roundwood production is implausible, whereas it is plausible for the case of industrial roundwood. Procedure IV is employed to estimate invisible employment number in CL2 countries with missing employment data through available recorded production statistics of industrial roundwood and wood fuel. For identified countries in CL3 and CL4, the number of persons in invisible employment are estimated following procedure III and V, based on total roundwood production and its labour productivity references. The large proportion of wood fuel removals in several countries in CL3 and CL4, such as Bhutan, Pakistan, Ethiopia etc. suggest that most of the invisible employment estimates is likely to be attributed in the production of wood fuel.

Table S7. Category of countries by cluster and estimation procedure.

Category/Criteria	Cluster	No. of country	Derived estimation procedure
<u>Countries with employment statistics</u>			
Implausible labour productivity of harvesting roundwood and industrial roundwood	CL2	4	<u>Procedure I</u> $I_{IRW} = \frac{IRW_{total}}{LP_{ref}^{IRW_{total}}} - E_{statistics}$ $I_{WF} = \frac{(WF_{total} * ShareRW_{fw})}{LP_{ref}^{fw}} + \frac{(WF_{total} * ShareRW_{wc})}{LP_{ref}^{wc}}$ $I = I_{IRW} + I_{WF}$
Implausible labour productivity of harvesting roundwood, but plausible for the case of industrial roundwood		18	<u>Procedure II</u> $I_{WF} = \frac{(WF_{total} * ShareRW_{fw})}{LP_{ref}^{fw}} + \frac{(RW_{twf} * ShareRW_{wc})}{LP_{ref}^{wc}}$ $I = I_{WF}$
Implausible labour productivity of harvesting roundwood	CL3	2	<u>Procedure III¹</u> $I_{RW_{total}} = \frac{RW_{total}}{LP_{ref}^{RW_{total}}} - E_{statistics}$
	CL4	2	$I = I_{RW_{total}}$
<u>Countries without employment statistics</u>			
	CL2	43	<u>Procedure IV</u> $I_{IRW} = \frac{IRW_{total}}{LP_{ref}^{IRW_{total}}}$ $I_{WF} = \frac{(WF_{total} * ShareRW_{fw})}{LP_{ref}^{fw}} + \frac{(RW_{twf} * ShareRW_{wc})}{LP_{ref}^{wc}}$ $I = I_{IRW} + I_{WF}$
	CL3	4	<u>Procedure V¹</u> $I_{RW_{total}} = \frac{RW_{total}}{LP_{ref}^{RW_{total}}}$
	CL4	12	$I = I_{RW_{total}}$
Countries with plausible labour productivity			
	CL1	7	No invisible employment estimates
	CL2	31	
	CL3	33	
	CL 4	16	

Notes: 1. Estimation is based on total roundwood removals and its labour productivity due to a lack of sufficient reference information on labour productivity, further disaggregated by industrial roundwood and wood fuel harvesting. 2. I denotes invisible employment in FTE which can be for total roundwood production (RW_{total}), total industrial roundwood (IRW_{total}), and total wood fuel removals (RW_{WF}). 3. Total wood fuel removal (WF_{total}) is an aggregated roundwood of firewood (RW_{fw}) and wood for making charcoal (RW_{wc}) in the unit of cubic metre (m^3). 4. $LP_{ref}^{RW_{total}}$, $LP_{ref}^{IRW_{total}}$, LP_{ref}^{FW} and LP_{ref}^{WC} stand for labour productivity references (m^3 / FTE) of removals of total roundwood, industrial roundwood, firewood and roundwood for making charcoal, respectively. Further details are presented in Table 4. 5. $E_{statistics}$ refers to visible employment statistics (persons FTE) in the forestry and logging subtracted by number of persons engaged in gathering of NWFP, when country data are available. 6. $ShareRW_{fw}$ and $ShareRW_{wc}$ are the share of firewood and wood for charcoal production. The calculation procedure can be found in the sub-section 3.1 (equation 3 and 4).

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