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The Employment Generation Impact of Meeting SDG Targets in Early Childhood Care, Education, Health and Long- Term Care in 45 Countries

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and Kijong Kim

Gender,
Equality
and Diversity
& ILOAIDS
Branch



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**The Employment Generation Impact
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*Ipek Ilkkaracan
and
Kijong Kim*

Preface

Care work, both paid and unpaid, is a foundation of our society and of vital importance to sustainable development. Paid care work, in particular, plays a crucial role in meeting care needs, and women account for two-thirds of paid care workers in the global care workforce. However, there tends to be a large gap between the supply and the increasing demand for care work across the world. Unpaid care work largely fills this gap and women and girls perform more than three-quarters of the total amount of unpaid care work. Also care workers are frequently migrants and working in the informal economy with inadequate working conditions and for low pay. In the coming years, the need for care and the demand for care workers are likely to increase due to demographic, socio-economic and environmental transformations. Without adequate investment in more and decent care jobs, a global care crisis is expected to undermine progress on gender equality at work.

In light of the current debates on the future of work and the adoption of the Sustainable Development Agenda, *The Employment Generation Impact of Meeting SDG Targets in Early Childhood Care, Education, Health and Long-Term Care in 45 Countries* examines the role of investing in care work in future job creation. Based on the analysis of 45 countries, which represent 85 per cent of global GDP and close to 60 per cent of the global population and workforce, this microeconomic simulation study provides an estimation of the employment generation in care sectors, including early childhood care and education (ECCE), primary and secondary education, tertiary education, ill/patient care (short-term care) and long-term care for older persons and persons with disabilities (LTC). By estimating levels of required expenditure, the potential expansion of employment in education and health and social work is considered under a high road scenario and a status quo scenario. The status quo scenario is developed to keep the current coverage rates, quality standards and working conditions constant, based on the idea that there would be no change in the policy environment. On the other hand, the high road scenario builds on relevant targets set by the Sustainable Development Goals (SDGs), especially Goal 3: good health and well-being, Goal 4: quality education, Goal 5: gender equality and Goal 8: decent work and economic growth.

The study finds that achieving the SDGs in the care economy (high road scenario) will result in a total of 475 million jobs by 2030. That is 117 million additional new jobs over and above the status quo scenario, or 269 million more jobs compared with the number of jobs in 2015. Under the high road scenario, such investment in more and better quality care jobs would help to tackle gender inequalities in the labour market and promote women's economic empowerment.

The Employment Generation Impact of Meeting SDG Targets in Early Childhood Care, Education, Health and Long-Term Care in 45 Countries is part of a series of research papers that was commissioned as background research for the major ILO report *Care work and care jobs for the future of decent work*. This major report and related research build a compelling and evidence-based case for placing good quality care work as a priority in macroeconomic, social protection, labour and migration policies agendas. These publications represent an important contribution to the ILO's Women at Work Centenary Initiative, which has been examining why progress in closing the gender gaps in the world of work has been so slow and what needs to be done for real

transformation. It has also been identifying innovative action to guide work on gender equality and non-discrimination as the ILO enters its second centenary.

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I. Introduction

This paper explores the employment generation capacity of investing in the care economy at a global level and into the future by 2030. The analysis entails projection of the number of direct and indirect jobs that can potentially arise under alternative scenarios of social care services expansion using input-output analysis. In addition, the levels of expenditure required for the realization of these different scenarios are estimated. The analysis covers a total of 45 countries for which input-output tables are available.¹ These countries account for 85 per cent of total global GDP; 58 percent of global population; 57 percent of global workforce. While richer countries are overrepresented in this sample, there are four lower-middle income countries (India, Indonesia, Philippines, and Viet Nam) and nine upper-middle income countries (Argentina, Brazil, Bulgaria, China, Mexico, Peru, Romania, Russia, and Turkey).

The care services as defined in this analysis entail:²

Education Services Sector:

- Early childhood care and education (ECCE)
- Primary and secondary education
- Tertiary education

Health Care Services Sector:

- Ill/patient care (short-term care)
- Long-term care for older persons and people with a chronic disability and illness (LTC)

The combined current employment (ILO GED estimates for 2015) in education and health care³ sectors in the 45 countries included in the simulation amounts to approximately 206 million workers. This constitutes almost 50 percent of global care employment. In approximately a dozen countries, the combined education and health care employment makes up more than one fifth of their total employment, which is evidence of their current good coverage of health and education (but not necessarily early childhood care and education or long-term care). The combined Health and Social

¹ The countries are Argentina, Australia, Austria, Belgium, Brazil, Brunei, Bulgaria, Canada, China, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, India, Indonesia, Ireland, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Mexico, Netherland, Poland, Portugal, Republic of Korea, Peru, Philippines, Romania, Russia, Slovak Republic, Slovenia, Spain, Sweden, Tunisia, Turkey, United Kingdom, United States and Viet Nam.

² The definition of social care services varies, ranging from a narrow definition limited to early childhood care and long-term care (ill, older persons and disabled care) to wider definitions including domestic services for care of healthy adults and health services for patient care. The operational conceptualization of social care services used here is based on the following definition of ‘care work’ by Esquivel (2017): “Care work constitutes a subset of service work, characterized by interpersonal relations and face-to-face services that contribute to the development of the human capabilities of the care recipient (“nurturance”).” This includes a wide range of workers, ranging from doctors and nurses, early-education and primary and secondary school teachers, university professors, and therapists to nannies, childcare workers and health aides. While social workers (hence social services) also fit within this definition, the analysis in this paper excludes this sub-sector of social care.

³ Including social workers since sectoral employment statistics is provided in an aggregate manner for health and social work.

Work and Education current expenditures of these 45 countries (public and private expenditures combined) represent 8.7 per cent of their total GDP.⁴

The potential for expansion of social care services are considered under the following two scenarios:

i. High road Scenario: The desired case where professional care services are expanded by 2030 to meet the relevant targets set by the Sustainable Development Goals (SDGs) in terms of extent of population coverage as well as quality of services and of employment;

ii. Status quo Scenario: A counter-factual (baseline) case, which assumes that the care economy will expand along with population increase but keeping the current coverage rates and quality standards constant such that the care deficits persist into 2030.

The normative framework guiding the setting of targets under the high road scenario is defined by the following SDGs:

SDG 3: Ensure healthy lives and promote wellbeing for all at all ages;

SDG 4: Ensure inclusive and quality education for all and promote lifelong learning;

SDG 5: Achieve gender equality and empower all women and girls; in particular,

- SDG 5.4: Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate;

SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Hence the high road scenario fulfils the coverage and quality targets in health and education as foreseen under SDG 3 and 4 simultaneously with the decent work goal as foreseen in SDG 8. This is one of the distinguishing aspects of this simulation from previous estimations on health and education. An implicit outcome therein is meeting also SDG 5 on gender equality both through reduction of women's unpaid work hence relieving restrictions on female labour supply, and job generation promoting demand for female labour.

Some of the social care sub-sectors listed above, such as primary and secondary education or ill/patient care, have clear SDG indicators and policy targets.⁵ On the other hand, there are weak or no clear indicators in the SDGs for other sub-sectors of social care services such as ECCE and LTC (*see Appendix I: SDG 3 and 4 and Related Global and Thematic Indicators*).

In defining the high road scenario in these sub-sectors of social care, we adopt a broad reading of the SDG targets and go beyond the monitoring framework. As such the

⁴ Based on the sectors' shares of GDP in 2011 and applied to 2015 in the absence of 2015 industry account information.

⁵ <https://unstats.un.org/sdgs/indicators/indicators-list/>

specific targets for ECCE and LTC are formed in line with current indicators in the high-performing countries as explained in the proceeding sections.

The specification of the high road scenario entails foremost the setting of targets that relate to the extent (quantity) of service provisioning. Such outreach targets are captured by enrolment and coverage rates based on the relevant target population. The high road targets also pertain to quality of services and employment as captured by ratios of service providers to service receivers and wage levels.

The status quo scenario applies observed conditions in education and health coverage and quality as of 2015 to the projected population for 2030 to estimate the level of related expenditures and employment if there would be no change in the policy environment. Hence the status quo scenario provides a baseline projection into 2030, against which to compare the high road scenario.

The difference of the results from the two simulations provides an estimate of the additional expenditure necessary for expansion of social care services if the specific SDG-guided targets defined under the high road scenario are to be met. It also provides an estimate of the additional employment likely to be generated if social care expenditures are to be increased in this manner. The additional employment to be generated through increased spending is estimated in two categories:

- Direct (sectoral) employment in education and health care; which in turn consists of two sub-categories of
 - care workers
 - support (non-care) workers; and
- Indirect employment in other sectors triggered through backward linkages.

Care workers are the ones that provide face-to-face direct care services, such as teachers, doctors, nurses or long-term care workers. Support (non-care) workers constitute part of direct employment in that they are employed directly in the education or health sectors. Nonetheless, they differ from care workers in that they perform tasks that support direct care work such as for example, management, finance and accounting, transportation, cooking and cleaning. Indirect employment, on the other hand, is the terminology used to describe the jobs in sectors other than health or education generated through backward linkages of the inter-industry supply chain.

Estimates of the required number of care workers are based on the various scenario assumptions such as enrolment/coverage rates or care provider to beneficiary ratios. The number of required support (non-care) workers derives from the preliminary estimate of care workers based on observed or desirable ratios. Their summation yields total sectoral employment, which then provides the basis for estimation of required sectoral spending. Once the magnitude of spending under the different scenarios is determined, it becomes possible to estimate the indirect employment effects through input-output analysis.

An additional employment generation effect is likely to come as a result of increased expenditures on care sectors boosting household consumption spending. It is also possible to estimate such induced employment generation through the input-output analysis. The induced effects are however not taken into account here in order to avoid

an overestimation bias. As such the results presented in this study should be interpreted as a lower bound on the expected number of jobs.⁶

The rest of the paper is structured as follows: Sections II and III explain the simulation methodology and present the results of the high road versus the status-quo scenarios on education and health care sectors respectively. Early childhood care and education (ECCE) and long-term care (LTC) constitute particular focus of the analysis, as these are the two areas where formal care service deficits are the most intensive. Section IV expands employment estimates presented in Sections II and III, to cover other categories of education and health care workers and enable a comparison to the current (2015) sectoral employment levels. Section V discusses the potential substitution effect of expansion of social care services on informal employment of domestic workers. Section VI presents the results of an assessment of short-run fiscal feasibility of increased spending on social care services in terms of fiscal returns. Section VII concludes with an assessment of combined results on education and health.

II. Education

II.A. Early Childhood Care and Education (ECCE)

ECCE service provisioning takes place in a variety of forms:

- formal services provided in an institutional setting, namely day care centres and preschools;
- paid care services provided in a home-based setting (through formal or informal employment of domestic workers);
- unpaid or subsidized care services by family and friends in a home-based setting.

Unpaid care by family and friends constitutes the bulk of service provisioning. In developed economies, there is almost full access to preschools for children of 3 years of age and above and in many developing economies, there is an increasing trend. For the younger age group, institutional services are less accessible, with higher reliance on unpaid or subsidized family care and paid domestic care. The high road scenario for ECCE foresees increased access to quality services in an institutional setting in line with the SDG framework.

⁶ Indirect employment generation can be estimated through two types of multipliers in the input output analysis: Type I and II. Type I multipliers account for the multiplicative effects of inter-industry (backward) linkages, such as intermediate input demand and supply. Beyond inter-industry linkages, Type II multipliers also account for the multiplicative effects of increased household consumption, called the “induced” employment effects. The literature on the topic suggests that type II multipliers entail an overestimation bias as they are based on the assumption of fixed ratio consumption to labour income, and not all of the additional income may be spent on current consumption. Oosterhaven, Piek and Stelder (1986) argue that the ‘true’ multiplier lies somewhere between Type I and Type II multipliers, which may be considered to be lower and upper bounds. The extent of the overestimation lies in the range of 50-200 per cent of results from using type I multipliers, in practice. To avoid an overestimation criticism, this study reports solely on type I multiplier effects (indirect employment effect in other sectors through backward supply linkages) and excludes the induced effects from increased household spending.

SDG 4.2 calls for access of all children “to quality early childhood development, care and pre-primary education so that they are ready for primary education” but does not specify an enrolment rate. The corresponding indicators point to “proportion of children under 5 years of age who are developmentally on track in health, learning and psychosocial well-being, by sex” (4.2.1.) and foresees merely 1-year preschool for children under the mandatory school age (4.2.2). Thematic indicators 9, 11 and 12 refer to enrolment ratios and number of years of access to ECCE without specifying any further targets. The UNESCO Education for All Report (2015) suggests a number of targets and indicators on quality of ECCE in the framework of the SDGs.⁷ The simulation’s policy targets in terms of coverage and quality of ECCE are set within this framework.

In setting the targets for ECCE, younger and older children are treated separately, as it is well established in the field: early childhood development pertains to the 0-2 age group, and pre-school education pertains to the 3-to-mandatory school age group. Data on enrolment by age group is widely compiled and reported for the 3-5 age group. In addition, cross-country information is available on coverage and quality indicators beyond enrolment rates such as average years of access to pre-school education, child-teacher ratios, and teachers’ salaries, amongst others. This enables an accurate assessment of the current situation and setting of policy targets against this background. For the 0-2 age group, however, data is available only for the EU and the majority of OECD countries. Nevertheless, there has been increasing attention on early childhood development in recent years. The information available from recent assessments by international agencies such as UNESCO, OECD and ILO form the bases to establish quantitative and qualitative targets under the high road scenario, as explained in the following discussion.

- ***Policy Targets on Enrolment Rates in Formal ECCE Institutions***

As of 2014, the OECD-34 average enrolment rate in formal childcare for the 0-2 age group is 35 per cent and in pre-primary education for age group 3-5 is 84 per cent.⁸ Almost all advanced OECD countries have close to universal coverage for pre-primary education (3-to-mandatory school age). The EU has an average enrolment rate of 31 per cent for the 0-2 age group and 85 per cent for the 3-5 age group. These remain below the EU Barcelona targets set in 2002, which called for a minimum of 33 per cent of children under age three and 90 per cent of children between 3 years old and the mandatory school age with access to formal care services by 2010.⁹ Formal childcare services are defined as all kinds of care organized and/or controlled by a public or private structure. Hence care provided by paid employees in a home-based setting, “without any structure between the carer and the parents (direct arrangements) has been

⁷ <http://en.unesco.org/gem-report/allreports>, p. 53-73; p.295-296.

⁸ OECD Statistics, Family Database, PF3_2_Enrolment_childcare_preschool

⁹ There were no new ECCE targets set by the EU after 2010, the target year of the Barcelona criteria on ECCE. The only more recent specified target is by the Education Summit of the European Commission which calls upon members to have at least 95% of pre-school children of 4 years or older participate in early childhood education. http://ec.europa.eu/education/policy/school/early-childhood_en

excluded from the definition of “formal care” in order to take count of only childcare recognised as fulfilling certain quality criteria.” (European Commission, 2008, p.2).¹⁰

UNESCO (2016a; p.207) reports a gross global enrolment ratio of 44 per cent in early childhood development and pre-school education combined.¹¹ Compared to a baseline assessment in 1999, this represents a substantial (64 per cent) increase in pre-primary enrolment rates (UNESCO 2015). Yet the improvement has been with great inequality by region as well as by socioeconomic status within each country. The gross pre-primary enrolment rate for low- and lower middle income countries is much lower at 37 per cent (Wils 2015, p.17).¹² It is even lower for particular regions such as Southern Asia at only 18.5%, sub-Saharan Africa at 21.5 per cent, and Western Asia at 29 per cent (UNESCO 2016b, p.207). OECD data shows that even though overall participation rates are high in these high income countries, there is substantial variation in children’s access to ECCE by socioeconomic indicators such as household income and mother’s education. Approximately one quarter (26.6 per cent) of children aged 0-2 in the lowest tertile of income distribution have access to formal ECCE, versus close to half (44.3 per cent) of children from the highest income tertile; 31 per cent of children whose mothers have less than tertiary education enrol in ECCE versus 43 per cent of children whose mothers are tertiary graduates.¹³

A projection exercise by UNESCO (2015)¹⁴ at estimating the necessary increase in spending by low- and lower middle income countries for SDG 3 to be met by 2030, assumes a policy target of 100 per cent enrolment rate in formal ECCE. This enrolment rate is defined in terms of the share of children who have had at least one year of access to ECCE.¹⁵ UNESCO (2016a) reports that globally 207 countries have some form of formal ECCE; of these 79 have free and 50 have compulsory pre-primary education.

Against this background, the ECCE global policy target in the high road scenario is set at 50 per cent enrolment rate for the 0 to 2 years old age group, and a 100 per cent enrolment rate for the 3 to 5 year old age group in each country/region.

The reasoning is as follows: in setting a policy target for the 0-2 age group, it was acknowledged that quality care for young children will entail a combination of home-based (predominantly parental/ family) care particularly in the first phase of 0 to 12 months, followed by increasing enrolment in formal ECCE institutions in the latter phase of 12-36 months. The high road scenario follows the “best performing countries” in the OECD. Given the complementarity of home-based and institutional care, the “best performing” countries cannot be identified simply on the basis of highest

¹⁰ The EC (2008) report notes: “Formal arrangements means EU-SILC reply categories 1 to 4 (pre-school or equivalent, compulsory education, centre-based services outside school hours, a collective crèche or another day-care centre, including family day-care, professional certified child-minders). As regards the 3 to compulsory schooling age group, it has to be noted that pre-school arrangements (that concern a large proportion of children) are included under the heading of formal arrangements.” (p.3)

¹¹ Pre-primary gross enrolment ratio is the number of children enrolled in pre-primary education as a percentage of the population of children in the relevant age group. This is the most common indicator with the widest country coverage (UNESCO 2016a, p.207).

¹² This the average value for the 82 countries included in Wils (2015), p.3.

¹³ OECD Statistics, Family Database, Chart PF3.2.B and Chart PF3.2.C.

¹⁴ See Wils (2015) for a detailed projection of costing of necessary education spending to meet the SDGs by 2030.

¹⁵ <http://en.unesco.org/gem-report/allreports>, p. 295.

enrolment rates in childcare centres. Rather for this young age group, coverage is defined as a combination of access to formal childcare institutions as well as parental care subsidized through care leave insurance (for both wage and salary workers and for self-employed workers) or care allowance (for the non-employed).

To identify the best-performing countries (i.e. best coverage defined as a combination of subsidized parental care plus day care centres), we used the OECD statistic on the “the lowest use of informal childcare” as a proxy.¹⁶ This is preferable to using simply “the highest formal enrolment rate” because the latter might still exhibit a high dependence on informally employed domestic workers for childcare. It should be noted here that the definitions of “informal” by the OECD and the ILO differ. While for the ILO “informal” childcare refers to status of employed workers,¹⁷ the OECD defines “informal childcare” as care “provided by grandparents or other relatives, friends, or neighbors for which, the provider did not receive payment.”¹⁸

The OECD countries with the lowest levels of use of informal childcare are Norway, Finland, Sweden and Denmark, where the use of informal childcare is at 0 per cent, 0.3 per cent, 2.2 per cent and 5.2 per cent respectively (see Appendix II: Setting of ECCE Policy Target for 0-2 age Group).¹⁹ These stand against the OECD-24 average for use of informal childcare in age group 0-2 at 25 per cent (and the average for the EU at 26 per cent). These four countries are known for their generous parental leave policies as well as high rates of formal childcare enrolment (except for Finland which has a relatively lower enrolment rate). The gross enrolment rate of children in the 0-2 age group is 65 per cent in Denmark, 55 per cent in Norway, 47 per cent in Sweden and 28 per cent in Finland. Given also the very high female employment rates in these countries, it can be safely assumed that care for children in the 0-2 age group is “fully covered” through a combination of subsidized parental care and use of formal childcare institutions, rather than informal care arrangements.

Note that these best performing countries are not necessarily the same as the countries with the highest use of formal childcare, which are Denmark (65 per cent), Iceland (60

¹⁶ We are grateful for suggestion of this methodology and supply of relevant data by ILO GED (see Appendix II for details).

¹⁷ The ILO Resolution concerning decent work and the informal economy defines “informal employment” as activities by workers that are not covered or insufficiently covered by formal arrangements. Activities are not included in the law, because they may be operating outside the formal reach of the law; or they maybe covered on paper but not in practice, which means they are operating within the formal reach of the law, the law is not applied or not enforced; or the law discourages compliance because it is inappropriate, burdensome, or imposes excessive costs. <http://www.ilo.org/public/english/standards/relm/ilc/ilc90/pdf/pr-25res.pdf> Hence informal childcare by the ILO definition refers to care provided by informally employed workers, usually implying without a contract, right or benefits.

¹⁸ Note that this excludes parental care and the definition is not standard for all countries; some countries (Australia, Korea and the United States) use slightly different definitions and comparability and data issues are noted by OECD in detail. OECD also presents information on the proportion of children using neither formal childcare nor informal childcare, i.e. the share of children that are usually cared for only by their parents (<https://www.oecd.org/els/family/PF3-3-Informal-childcare-arrangements.pdf>). Formal care, on the other hand, is defined as care in centre-based services (e.g. nurseries or day care centres, pre-primary education and out-of-school-hours centre-based services), organised family day care, and care services provided by (paid) professional child-minders (http://www.oecd.org/els/soc/PF3_2_Enrolment_childcare_preschool.pdf).

¹⁹ The OECD Family Database provides data on both formal and informal childcare arrangements in the OECD countries (see: <http://www.oecd.org/els/family/database.htm>)

per cent), the Netherlands (56 per cent) and Luxemburg (55 per cent). Accounting for hours of use of formal childcare, full-time equivalent participation rate, the highest use of formal childcare is in Denmark, Iceland, Norway, Luxembourg and Portugal. Nevertheless, those other than Denmark and Norway also have relatively high use of informal childcare for this young age group: The Netherlands (56 per cent), Portugal (35 per cent), Luxemburg (25 per cent) and Iceland (21 per cent).

Based on the four best-performing OECD countries identified on the basis of lowest use of informal childcare for the 0-2 age group, an average population-weighted gross enrolment ratio in formal childcare would provide a target coverage rate. This is approximately 50 per cent (see Appendix II). Hence we set the policy target for early childcare for the 0-2 age group at 50 per cent enrolment rate in formal childcare institutions.

The latter policy target for the age group 3-5, i.e. 100 per cent target enrolment rate in pre-school education, is based on the observation that the majority of high- and upper middle-income countries have achieved close to universal coverage for this age group. As it was reported above, for pre-primary education (3 to mandatory school starting age), most advanced OECD countries have close to 100 per cent enrolment for pre-primary education. Highest enrolment rates observed are France (100 per cent), Malta (99 per cent) Belgium and Israel (98 per cent), Germany, Spain and Norway (97 per cent), Iceland and Denmark (96 per cent) and Italy (95 per cent). The OECD-34 average enrolment rate in formal pre-primary education for age group 3-5 is 84 per cent and for the EU 85 per cent. The global gross pre-primary enrolment rate for this age group is 49 per cent.²⁰

In addition, access to pre-school education is acknowledged as a legal right, provided for free and even compulsory in many countries, on the basis that it serves to prepare children for school readiness. Moreover, the lack of access to free publically provisioned services facilitates inequalities amongst children by income and socioeconomic status.

Given these trends and also as access to formal education in the 3-5 age group is increasingly defined as an educational norm (similar to mandatory primary and secondary education), in the high road scenario, we set a policy target of universal coverage for the 3-5 age group, i.e. 100 per cent enrolment rate in pre-school education globally in each country/region.

- ***Policy Targets on Quality of ECCE Service Delivery and Employment***

Beyond policy targets in terms of enrolment rates, we also specify targets in terms of quality of formal ECCE services. The SDG target on early childhood development explicitly emphasizes education of good quality. Quality of ECCE services is as crucial to ensure that ECCE serves its purpose of supporting children's mental and social development with lasting effects throughout the life cycle. High quality ECCE services mean that provisioning needs to go beyond merely ensuring child safety and nutrition (UNESCO 2015). There are no internationally agreed guidelines, but two commonly used criteria for ECCE quality are ceilings on children to teacher ratio and teacher

²⁰ <https://data.worldbank.org/indicator/SE.PRE.ENRR>

(staff) salaries.

Based on the observation that wages of ECCE workers in many countries and instances do not reflect the significant contribution of the work, ILO (2013) specifies a set of key guidelines on decent work for ECCE personnel as follows:

“(a) base salaries and overall remuneration should reflect the importance attached to ECCE in relation to national income levels;
(b) remuneration should be adjusted as needed to a level that provides a decent standard of living in the area of work concerned;
(c) remuneration should be set at the same level as the equivalent job in primary education with similar qualifications and competency requirements (comparator professions), whether through separate or unified salary scales;
(d) remuneration levels should correspond to the responsibilities of the ECCE job (competencies and skills required) as set out in job descriptions objectively defined through systematic evaluation or appraisals of the work to be performed;
(e) equal remuneration for men and women workers for work of equal value.”
(ILO 2013; p.21)

Class/group size is another quality criterion. ILO (2013, p.28) points to evidence that maximum class or learning group sizes of 20 children and qualified staff–child ratios of approximately 1:10 or less as being most effective for learning outcomes in developed countries. Some international organizations have recommended a maximum staff–child ratio of 1:15 in pre-primary levels of high-income countries, while some national benchmarks establish a ratio as low as 1:3 for ages 0 to 12 months, and 1:5 for very early years education (1–3 years).

In setting specific qualitative policy targets on education, we follow ILO (2013) as well as UNESCO (2015), which are in line with the above ILO guidelines on decent work, and yet provide more specific quantitative measures.²¹ The following quality targets are used in the high road scenario simulation:

- Children/teacher ratio for early childhood development (0-2 age group) is set at a maximum of 10;
- Children/teacher ratio for pre-primary is set at a maximum of 15;
- Pre-primary teacher salaries are set at a minimum of 4.5 times of GDP per capita for the low- and lower middle-income countries following UNESCO (2015); and at a minimum of average salary of tertiary graduates for high and upper middle-income countries.²²

In assigning target levels of teacher salaries used in UNESCO (2015), the background paper by Wils (2015, p. 295) states: *“with respect to teacher salaries, which are usually the single largest cost, the assumptions are driven by the pupil/teacher ratio, which displays considerable variation across countries. Overall, both the ratio and the salary (expressed as a multiple of GDP per capita) tend to be higher in low-income countries,*

²¹ See p.295 UNESCO 2015 <http://en.unesco.org/gem-report/allreports> and the background paper for this report by Wils (2015), which explains how the specific quantitative measures for these qualitative targets are set.

²² The initial starting (baseline) mean value of pupil/ teacher ratio in pre-primary as of 2015 is reported by UNESCO 2015, p.295, as 27 children per teacher and pre-primary/primary teacher salary is reported as 3.6 times GDP per capita.

reflecting a scarcity of skills.” A comparison of teacher salaries to GDP per capita in upper-middle and high-income countries included in our analysis shows that salaries for most teachers are no more than twice the per capita GDP, while their standard of living may be at or above national averages. To make the simulation based on feasibility, we instead set the goal to the average salary of tertiary educated workers for these countries.

The above quality targets set the minimum criteria to be met by all countries included in the analysis. If a country has better indicators than the above, then the simulation assumes they sustain that indicator to 2030 (see Supplementary Tables: Education).

II.B. Primary and Secondary Education

SDGs define clear targets for coverage in primary and secondary education. SDG 4.1 foresees that by 2030 all children complete free and quality primary and secondary education. Hence we set a ***100 per cent enrolment rate for the projected primary and secondary school-age populations*** for all countries.

As for quality of services and employment in primary and secondary education, we again largely follow the UNESCO (2015) targets as minimum follows:

Primary education:

- Student/teacher ratio is set at a maximum of 31;
- Primary teacher salaries are set at a minimum of 4.5 times of GDP per capita for the low- and lower middle-income countries following UNESCO (2015); and at a minimum of average salary of tertiary graduates for high and upper middle-income countries.

Secondary education:

- Student/teacher ratio is set at a maximum of 28;
- Secondary teacher salaries are set at a minimum of 4.5 times of GDP per capita for the low- and lower middle-income countries following UNESCO (2015); and at a minimum of average salary of tertiary graduates for high and upper middle-income countries.

Again, if a country has better indicators in primary and secondary education than the above targets, then the simulation assumes they sustain that indicator to 2030.

II.C. Tertiary Education

SDG Target 4.3 foresees ensuring “equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university” by 2030. There is no specific SDG target with respect to tertiary enrolment.

Under the high road scenario, we set as a policy target where the increase in tertiary enrolment increases in line with the average increase in secondary enrolment, which is approximately 30 per cent.

As far as quality indicators are concerned, we assume that the current observed student-to-teacher ratios as well as the salary rates for university teachers stay constant.

Table 1 provides an overview of the qualifying parameters of the status quo versus the high road scenarios disaggregated by level of education. Having set the parameters for the high road scenario under education, we move onto explaining the methodology and data employed in the simulation under the two scenarios.

Table 1 - Education Sector: High road vs. Status Quo Parameters

Parameters	ECCE		Primary and Secondary Education		Tertiary Education	
	SQ	HR	SQ	HR	SQ	HR
Enrolment Rate	Prevailing as of 2015	50% for 0-2 years old; 100% for 3-5 years old	Prevailing as of 2015	100%	Prevailing as of 2015	Enrolment increases by 30%
Student to Teacher Ratio	Prevailing as of 2015	10 for 0-2 years old; 15 for 3-5 years old	Prevailing as of 2015	31 for primary; 28 for secondary	Prevailing as of 2015	Prevailing as of 2015
Employment; Teacher Salaries	Prevailing as of 2015	Equal to 4.5 times GDP per capita for low- and lower middle-income countries; average salary of tertiary graduates for high- and upper middle income countries	Prevailing as of 2015	Equal to 4.5 times GDP per capita for low- and lower middle-income countries; average salary of tertiary graduates for high- and upper middle income countries	Prevailing as of 2015	Prevailing as of 2015

II.D. Methodology and Data for the Education Simulation

There are three main steps in the simulation:

1. Estimation of (direct) employment in the education sector

The estimation of direct employment in the education sector focuses primarily on school teachers (ECCE through tertiary) as care workers and related non-teaching support workers. For the former, the projected children (student) population by age group in 2030 is multiplied to the enrolment rate by level of education to find the number of children (students) to be covered, and divided by the student-to-teacher ratios again by level of education to derive direct teacher employment. The status quo scenario is based on the prevailing current (2015) net enrolment rates and student-to-teacher ratios from UNESCO Institute for Statistics (UIS). The high road scenario is based on SDG-based target enrolment rates plus target children-to-teacher ratios as defined above.

‘Current’ values are used for the status quo where ‘current’ implies values observed for 2015, which is the most recent year for which the data is available. Hence the status

quo scenario applies observed conditions in education coverage and quality as of 2015 (see: Supplementary Tables: Education) to the projected population for 2030 to estimate education-related employment (and the level of education expenditures explained below).²³ The target enrolment rates and student-to-teacher ratios for the high road scenario were explained above. For the countries that already reached these targets, the actual values replace them.

Once the number of direct care workers (teachers) necessary to meet the SDG targets by 2030 is established, the next step is to estimate the necessary number of non-teaching (support) staff to be employed in the education sector. This is computed using the current ratios of non-teaching to teaching staff as derived from sectoral employment data provided by ILO GED.

Employment data in the education sector (as well as in the health sector) is provided by ILO-GED disaggregated by care workers (teaching or health professionals) versus non-care workers. Based on this, we derive the teaching-to-non-teaching staff ratio (number of non-teaching workers in education required to support each teaching professional). This approach is based on the assumption that the production technology of the education sector in terms of this ratio remains constant over time. In other words, we assume there is no labour saving technological change in education.

The difference in teacher employment between the two scenarios derives from assumptions of different enrolment rates and student-to-teacher ratios. The assumption of improved enrolment rates and student-to-teacher ratios under the high road scenario, results in a difference in the non-teaching staff employment.

2. Costing of necessary expenditures on education

In costing the education expenditures for the 45 countries in the IO analysis, two different approaches are used: Per-teacher cost and per-student cost. The per-teacher cost method uses the annual average actual salaries of teachers in public institutions disaggregated by level of teaching. This was used for the higher income countries where data was available (15 countries). Teachers' actual salaries were compared to earnings of tertiary-educated workers for age group 25-64 from the Education at a Glance by the OECD. For the high road scenario, average earnings of tertiary educated workers were set a minimum target for teacher salaries. Wherever the teacher salaries are lower than average earnings of tertiary educated workers, they were adjusted upward. The original salary data are reported in PPP²⁴ USD for private consumption, and subsequently converted to current US dollars (2014-15) using the conversion tables from the World Bank. These salaries are the basis of the costing by level of education for the countries with the information. Combining the salary information with the target number of students, student-teacher ratio, we find total wage expenditures.

The teaching staff compensation as a percentage of total expenditure in public institutions (from the UIS) is used to derive the non-wage expenditures. The sum yields

²³ For current observed conditions in education coverage and quality as of 2015 see: Supplementary Tables: Education.

²⁴ Purchasing power parity.

the total costs by level of education and by scenario. The share of workers' compensation as a percentage of total cost in the 45 countries included in the analysis is in the range of 70-80 per cent. This is similar to the 75 per cent wage share as adopted in Wils (2015), who assumes that once wages are set, non-wage costs should make up at least 25 per cent of total expenditures. These shares are used to extrapolate the total cost from the target wage payment.

For the rest of the countries without the actual salary information, the per-student cost method is applied. The sum of initial funding of education by source and per-student from the UIS constitutes the per-student cost. The product of the cost and the target student enrolments yields the total cost by level of education and by scenario. For the low- and lower-middle income countries in our input output analysis, India, Indonesia, Philippines and Vietnam, we use the per student costs from Wils (2015).

Some countries still have missing price information or other key variables for costing. Imputation of missing values for key variables, such as per-student cost and student-teacher ratios by level of education, are done in two steps. First, the values of the nearest country in terms of per capita GDP are adopted, as it appears the single most significant variable in a simple OLS regression exercise. Second, specific to China, because of lack of information from the UIS, the necessary information on enrolment, per-student cost, the number of teachers by level of education were collected from the following sources: China Statistical Year Book 2014 by the Ministry of Education and 2013 national education funding implementation statistics notice for per student government expenditure.²⁵ Then, the per-student cost method yields the total cost by level of education.

The status quo scenario assumes that the current enrolment rates, children/student-to-teacher ratios, teacher salaries and hence current expenditure per student by level of education will persist through the year 2030. Per-student costs are estimated using the initial government and household spending per student in USD from the UIS database. A number of countries do not report the price of pre-primary education in the database; for these we use the pre-primary student cost from Wils (2015). The UIS does not contain the per student information for the early child development programs. We assume that caring for the young children would cost 10 per cent more than caring for pre-primary students. A product of the projected number of students and the per-pupil cost yields the total cost by level of education.

The costing for per pupil in tertiary education is based on the initial government and household funding per student in US dollars and the enrolment in all tertiary education from the UIS. The initial government and household funding per tertiary student reported in the UIS database are summed to represent per student cost, and then it is multiplied by the number of enrolled students to compute the total cost. For the high road scenario, we scale up the total cost by 30 per cent to reflect the expected increase in the enrolment.

²⁵ See: <http://www.stats.gov.cn/tjsj/ndsj/2014/indexeh.htm>; and http://www.moe.gov.cn/srcsite/A05/s3040/201410/t20141031_178035.html

3. Estimation of indirect employment in sectors other than education

Once the costs associated with each scenario are computed, this is fed into input-output analysis to estimate the indirect employment to be generated in other sectors (other than education) through backward linkages.

The input-output tables come from two sources: The World Input-output Database (WIOD) and the OECD STAN database. WIOD covers the following 39 countries: Australia, Austria, Belgium, Brazil, Bulgaria, Canada, China, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, India, Indonesia, Ireland, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Mexico, Netherland, Poland, Portugal, Republic of Korea, Romania, Russia, Slovak Republic, Slovenia, Spain, Sweden, Turkey, United Kingdom, United States. The additional 6 countries from the OECD Stan database are as follows: Argentina, Brunei, Peru, Philippines, Tunisia, Viet Nam.²⁶

II.E. Simulation Results on Education

Under the status quo scenario where enrolment rates, student-to-teacher ratios and employment conditions remain constant to 2030, the total education expenditures are estimated to be approximately 3.5 trillion USD (in 2015 prices). To achieve the SDG targets the estimated magnitude of total expenditures is at 4.71 trillion USD. Hence the high road scenario foresees more than a one third (35 per cent) increase in education expenditures (Table 2). Expenditures under the high road scenario correspond to 4.7 per cent of the total GDP of the 45 countries included in our analysis versus 3.4 per cent of GDP under the status quo.

We find that under the high road scenario, increasing expenditures so as to meet the SDG targets on education creates a total of 167.7 million jobs in the education sector as well as in other sectors through backward linkages. This is one-and-a-half times more jobs than the status quo scenario where only 111 million jobs are to be created if enrolment rates, student to teacher ratios and employment conditions are to remain constant (Figure 1). Of the additional jobs (a difference of 56.7 million jobs between the high road and status quo scenarios), 40 million are direct jobs (in the education sector) and 17 million are indirect jobs (in other sectors).

²⁶ The employment intensity for Viet Nam, which seemed to entail a typo in the IO table, was revised down from 582 to 58.2 on the basis of comparison to countries with similar economic structure.

Table 2 - Education Sector: Employment Generation and Expenditures under the High road vs. Status Quo Scenarios

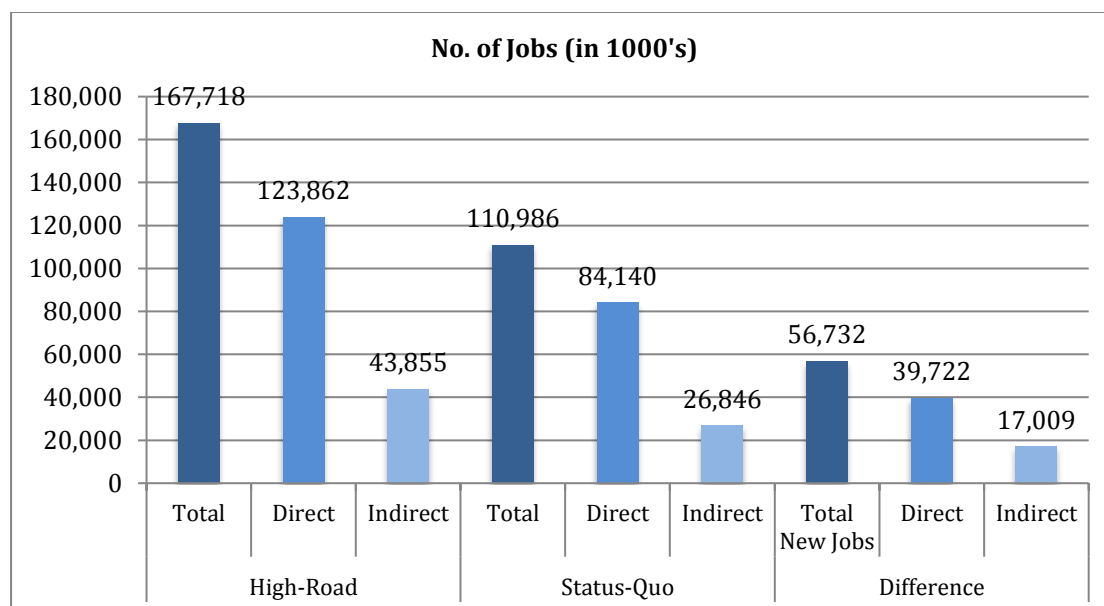
	ECCE			Primary and Secondary Education			Total (including Tertiary Education)		
	SQ	HR	Difference (%) (133)	SQ	HR	Difference (%) (21)	SQ	HR	Difference (%) (36.5)
Cost (required expenditures in trillion USD 2015 prices)	0.46	1.07	0.61	1.97	2.39	0.42	3.45	4.71	1.26
Cost as share of GDP (%)	0.5	1.1	0.6 p.p.	2.0	2.4	0.4 p.p.	3.4	4.7	1.3
Fiscal Returns as share of expenditures (%)							16.4	15.8	
Direct employment (1000's)	15,640	36,066	20,426 (131)	55,993	64,284	8,291 (15)	84,140	123,862	39,722 (47)
Indirect employment (1000's)							26,846	43,855	17,009 (63)
Total employment (1000's)							110,986	167,718	56,732 (51)

The difference in the number of direct jobs in education between the two scenarios is relatively small, compared to the difference in the indirect jobs. The number of education sector jobs created under the high road scenario is 47 per cent more than those created under the status quo scenario (124 million versus 111 million direct jobs), while the number of indirect jobs is 63 per cent higher (43.9 million versus 26.8 million indirect jobs).

The gender distribution of direct employment in the education sector favors women as would be expected (Figure 2): 60 per cent of the education sector jobs under the high road scenario are likely to go to women. As for indirect employment creation, the reverse is true: 61 per cent of the indirect jobs go to men. This is indicative of the gender-disaggregated nature of the labour markets across sectors and occupations.

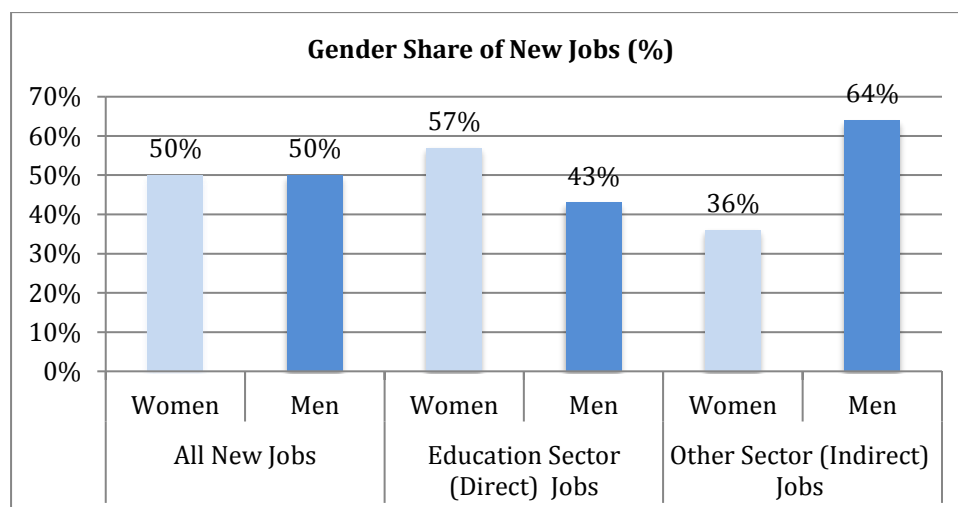
An interesting result, however, is that women's and men's share of additional job creation is almost equal with approximately 28 million additional jobs going to each group. While women get the lion's share of additional jobs created in the education sector, men compensate for it in acquiring majority of indirect jobs. Hence, meeting the SDG targets in education, particularly in terms of ECCE, would benefit women both in terms of relieving their unpaid work at home, and providing ample employment opportunities. Yet it also carries the potential to create an equivalent number of jobs for men not only in the education sector but also in other sectors through backward linkages, a fact that can garner support for this policy.

Figure 1: Jobs Generation in Education by Direct* and Indirect Jobs



* Direct jobs include only teaching jobs from pre-primary to tertiary level.

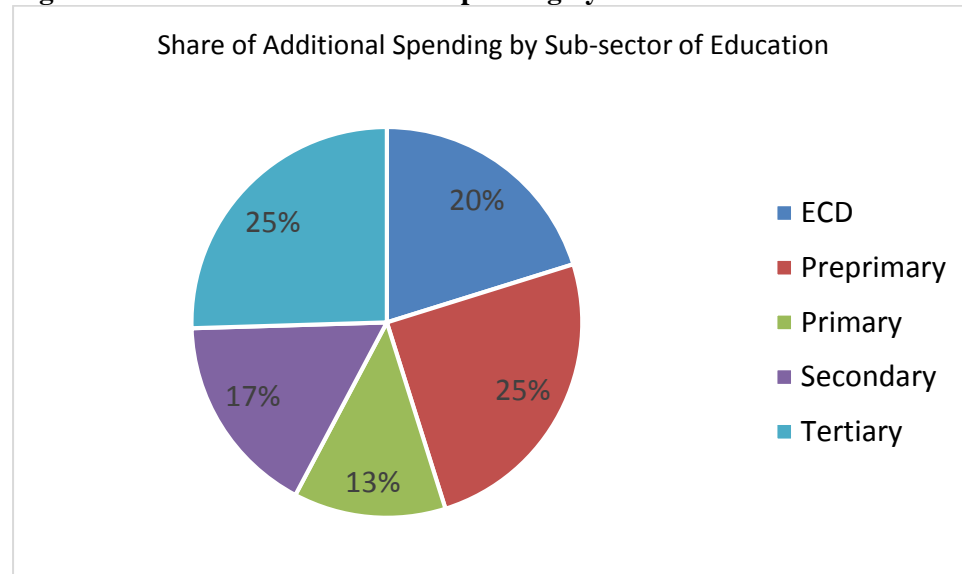
Figure 2: Distribution of Additional Employment in Education by Gender



A primary source of the difference between the two scenarios in expenditures as well as in employment is ECCE: The enrolment rates and children-to-teacher ratios are improved substantially under the high road scenario. Of total additional spending of 1.26 trillion USD, almost half (45 per cent) is on early childhood development for the 0-2 age group (20 per cent) and pre-school education (25 per cent) (Figure 3). This means that total spending on ECCE would need to increase from 0.4 per cent of GDP to 1.0 per cent of GDP to meet the SDG targets. Of the remaining additional expenditure, 30 per cent is spent on meeting enrolment and quality targets in primary

and secondary education (13 and 17 per cent respectively). Finally 25 per cent is due to increasing tertiary enrolment.

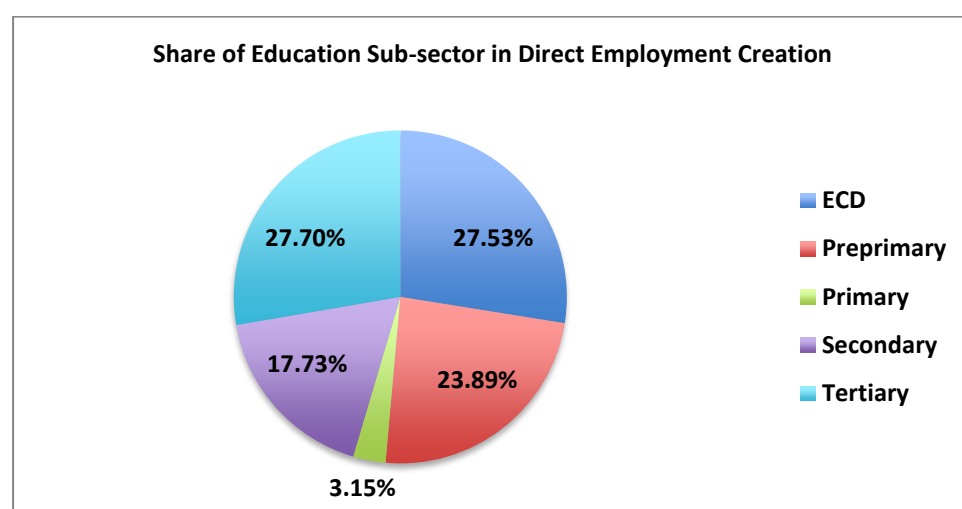
Figure 3: Allocation of Additional Spending by Sub-sector of Education



The allocation of additional spending by sub-sector of education reflects on allocation of additional employment generation (Figure 4). Of the additional direct employment creation of 39.7 million extra education sector jobs, more than half (20.4 million jobs) are generated in the ECCE sector. The younger age group (ECD) has a relatively higher share at 27.5 percent than pre-primary whose share is 23.9 percent. Primary and secondary education and tertiary education jobs make up for 20.8 per cent and 28 per cent of additional direct employment.

The lower share of primary and secondary education (despite relatively larger share of population in this group) is due to several factors. First of all, majority of the countries included in the analysis have already met primary and secondary education targets in enrolment; most of the higher income countries have also met quality targets in terms of student-to-teacher ratios and teacher salaries. Moreover, most of the countries included in this analysis, experience stale growth of their student-age population. On the other hand, there is ample room for expansion of early childhood development and pre-primary education, as well as improvement in quality indicators, such that ECCE accrues the lion's share in additional expenditure and employment.

Figure 4: Allocation of Additional Employment by Sub-sector of Education



- **Extrapolating simulation results for primary and secondary education to low- and lower middle-income countries**

The above results entail 45 countries of which the majority are high- or upper-middle income countries. This selection of countries was based on availability of IO tables, which enables estimation of indirect employment effects as reported above. A recent study by Wils (2015) undertaken to feed into the UNESCO Education for All Report (2015), projects costs required to universalize primary and secondary education (as well as one year of preschool) by 2030 in 83 low- and lower middle-income countries (of which 4 countries, namely India, Indonesia, Philippines, and Vietnam are also part of the IO analysis in this paper). This section presents a projection of the high road and status quo scenarios in the primary and secondary education sector, using data from Wils (2015). This additional exercise enables comparison of the estimated employment effects here (as far as primary and secondary education is concerned) to the UNESCO (2015) projections as a consistency check. It also provides a more encompassing global estimation, though limited to primary and secondary education only.

UNESCO (2015) estimates that globally (for 195 countries) there is a need for 69 million new primary and secondary teachers by 2030 to meet the universal enrolment targets as per SDG 4. For a verification of results, this global estimate is compared to the combined estimates of the 45 countries included in this analysis (and reported above) and the 79 additional lower income countries for which Wils (2015) provides data (Table 3).²⁷ The current analysis finds that the necessary number of teachers for universalizing primary and secondary education in the 45 countries included in this analysis, i.e. under the high road scenario, is 50 million (vs. 43.3 million under the status quo). For the 79 additional lower income countries, the number primary and secondary teachers required for the high road is estimated at 24.3 million (vs. 22.8 million under the status quo). This estimate of direct (teaching staff) employment was based on student-teacher ratios in 2015 and 2030, which yielded the number of teachers for the two scenarios. Adding up, the total number of primary and secondary teachers

²⁷ The 4 countries that are already included in the current analysis are excluded from the 83 low- and lower middle-income countries in the Wils (2015) study, leaving 79 additional countries in total.

required for 124 countries under the high road scenario is at 74.3 million (vs. 66.1 million under the status quo) for the 124 countries included in this exercise.

UNESCO's global estimation takes account of attrition rates plus staffing of new classrooms. The difference between current supply of teachers as of 2014 (reported at 62.3 million) and the additional teachers due to attrition (reported at 48.7 million) is 14.6 million; i.e. the number of teachers currently in the profession and would continue to teach into 2030. Adding this to the required new teachers of 69 million, UNESCO estimate implies that there is need for a total of 83.6 million teachers by 2030 for universal primary and secondary education. Considering that this global estimate is for 195 countries in the world, it compares consistently to our estimate of 74.3 million teachers covering 124 countries.

Estimation of employment was expanded beyond teaching staff to also cover non-teaching (support) workers in education and indirect employment in sectors other than education. For the non-teaching staff estimation for the low- and lower-middle income countries in Wils (2015), the mean value of the non-teacher-to-teacher ratios among the countries with per capita GDP of less than \$4,000, which is 0.2719, is multiplied to the numbers of teachers. In terms of indirect employment elsewhere, a standard indirect employment multiplier was assumed for all the countries, hence a more crude methodology than the IO analysis. This was the indirect employment multiplier of education sector in Tunisia, which is 2.0, applied in all countries. This value for Tunisia (2.0) is the lowest indirect employment multiplier among the low- and low-middle income countries in the IO analysis, and possibly yields under-estimation. Nevertheless looking at the list of countries in Wils (2015), it is reasonable to assume that most countries would not have a complex network of domestic industries for strong indirect effects.

Data on projected student enrolment and per-pupil costs, both disaggregated by level of education, for 2015 and 2030 is derived from Wils (2015). Total costs for 2015 and 2030 are the product of the number of students and per-student cost by level of education. The costs are then compared to the projected 2030 GDP from Wils (2015). The prices vary as the student-teacher ratios progress over time, and teachers' salaries rise to the target level by 2030. These two prices thus represent the quality differences.

The total numbers non-teaching workers in primary and secondary education are estimated at 6.6 million, making the total employment in education 30.9 million workers under the high road scenario (Table 3). As a result of using the lowest education sector multiplier, the indirect employment in other sectors seems moderate at a total of 600 thousand jobs. Altogether, a combined global estimate for primary and secondary education only, including direct and indirect employment and entailing 124 countries is at 108.7 million jobs versus 77.2 million for the 45 countries involved in this analysis. Comparing the high road employment generation for the 45 countries included in this analysis to a more comprehensive estimation for 124 countries, the latter yields about one-and-a-half times more jobs than the former.

Table 3: A Global Estimation of Primary and Secondary Education

Countries	Wils (2015) 79 low- and lower middle income countries		Current simulation 45 high and middle income countries		Total 79 + 45 = 124 countries	
	SQ	HR	SQ	HR	SQ	HR
Primary and Secondary Teachers	22,802,867	24,298,836	43,298,541	49,963,561	66,101,408	74,262,397
Support staff	6,201,144	6,607,966	12,694,371	14,320,263	18,895,515	20,928,229
Sub-total for Education Employment	29,004,011	30,906,802	55,992,912	64,283,824	84,996,923	95,190,626
Indirect employment	382,925	598,375	7,885,554	12,881,658	7,885,554	13,480,033
Total employment	29,386,936	31,505,176	63,878,466	77,165,482	93,265,402	108,670,659

III. Health Care and Long-term Care (LTC)

Health care entails provisioning of medical services for the overall population independent of age or disability status, towards maintenance or improvement of health, treatment of non-permanent or permanent health problems (i.e. short-term or long-term patient care). Long-term care (LTC), on the other hand, refers to provisioning of a diversity of services to support people “*who are limited in their ability to function independently on a daily basis over an extended period of time, due to mental and/or physical disability*” (Lipszyc, et.al. 2012, p.8). This pertains for most part, though by no means exclusively, to people of older ages. While LTC entails to some extent medical care, it also has a non-medical component, which is provisioning of support with activities of daily living.

In the Sustainable Development Goals framework, the area of health is addressed by SDG 3, which foresees “*ensuring healthy lives and promotion of well-being for all at all ages.*” This wide goal is further specified in the form of 13 targets and 27 indicators (see Appendix III). These are diverse, covering maternal and child mortality, sexual and reproductive health, epidemics, communicable and non-communicable illnesses, health hazards and deaths caused by environmental pollution, smoking and traffic accidents. The World Health Organization (WHO) has projections regarding the required numbers of health care workers for these SDGs to be met by 2030. Under health care, we use these projections as an input in the estimation of direct and indirect employment generation. Since LTC is not covered explicitly under SGD 3, we undertake an exercise parallel to the one that was undertaken for ECEC under education, following coverage rates by best performing countries. In the rest of this section, we first define and explain the high road scenario for these two components of care provisioning, followed by an explanation of the methodology and data employed in the simulation of the high road versus the status quo scenarios; and finally present a discussion of the results.

III.A. Health Care

- **Setting targets on the basis of human resources for health**

The targets foreseen by SDG 3 on health care are defined on the basis of health care recipients, such as reduction of maternal and neonatal mortality rates by a specified magnitudes, or similarly reductions in incidents of infectious diseases per 100,000 population. There exist a number of global projections on the human resource (i.e. health worker) requirements for such targets specified under SDG 3 to be met by 2030. The high road scenario for health care services is defined on the basis of two recent projections of human resources for health, namely by WHO (2016) based on Cometto (2016) and by the Dublin Declaration on Human Resources for Health (2017).

Based on the assessment that “*a health workforce of adequate size and skills is critical to attainment of any population health goal*”, WHO (2016a; p.6) forecasts the necessary supply of health workers necessary to meet the SDG targets in 2030. The estimates are disaggregated by occupation (doctor, nurse/midwife and other cadres)²⁸ and by region. The report also projects the actual expected supply of health workers in 2030 if current recent trends in training and employing health workers were to remain the same. The difference of these two projections constitutes the shortage of health workers within the SDG framework by 2030.

This projection employs a composite health index covering the following twelve key population health indicators as identified by WHO and the World Bank within the SDG framework:

1. Family planning
2. Antenatal care coverage
3. Skilled birth attendance
4. DTP3 (diphtheria-tetanus-pertussis) immunization
5. Tobacco smoking
6. Potable water
7. Sanitation
8. Antiretroviral therapy
9. Tuberculosis treatment
10. Cataract surgery
11. Diabetes
12. Hypertension treatment

²⁸ Other cadres include seven other broad categories of the health workforce as defined by WHO Global Health Workforce Statistics Database: dentistry personnel, pharmaceutical personnel, laboratory health workers, environment and public health workers, community and traditional health workers, health management and support health workers, and other health workers, including medical assistants, dieticians, nutritionists, occupational therapists, medical imaging and therapeutic equipment technicians, optometrists, ophthalmic opticians, physiotherapists, personal care workers, speech pathologists and medical trainees. The estimation uses a multiplier for all other cadres based on the countries with available data.

The estimations are derived through regression analysis and are weighted according to the global burden of disease. The threshold is set at a minimum needed to achieve the median level of attainment (25%) for this composite index of twelve indicators.

Accordingly, the resulting SDG index threshold is identified as 4.45 health workers (doctors, nurses and midwives) per 1000 population. This is almost double the index threshold of the previous WHO estimate in 2006 (at 2.3 health workers per 1000 population; WHO 2016a, p.10) and the increase rests largely on inclusion of non-communicable diseases.^{29,30}

WHO (2016)³¹ estimates that under a business as usual scenario, the global supply of health work force is likely to grow from its current estimated size of 43.5 million workers (as of 2013) to 67.3 million workers in 2030. To meet the SDG health index threshold as of 2013, it is estimated that there is a need for an additional 17.4 million health workers, of which approximately 2.6 million are doctors, 9 million are nurses and midwives, and 5.8 million are other cadres. The global shortage is projected to decrease by 17% to 14.5 million workers by 2030, remaining still a sizable gap. The global gap hides wide regional disparities, with as much as a shortage of 6.9 million workers being concentrated in South-East Asia and 4.2 million in Africa (WHO 2016, p.18).

A more recent international consensus, however, points to greater shortage of 18 million health workers by 2030. The Dublin Declaration, an outcome document of the Fourth Global Forum on Human Resources for Health held in November 2017, states the following:

“Call attention to the urgent need for robust, coordinated and transformative investments to address the escalating mismatch between the supply of, economic demand for, and population need for health workers, with projections pointing to an additional 40 million health worker jobs to be generated by 2030, largely residing in upper-middle and high-income countries, while a needs-based shortfall of 18 million health workers is anticipated for the same period, with gaps prominent in low- and lower-middle income countries.” (Dublin Declaration, p.2)

²⁹ Non-communicable diseases (NCDs), also known as chronic diseases, are not passed from person to person. They are of long duration and generally slow progression. The four main types of non-communicable diseases are cardiovascular diseases (like heart attacks and stroke), cancers, chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma) and diabetes. <http://www.who.int/mediacentre/factsheets/fs355/en/>

³⁰ Another threshold estimated by ILO (based on universal health coverage) was set at 3.4 health workers per 1000 population; and later revised up to 4.1 health workers per 1000 population. A higher threshold identified by the Ending Preventable Maternal Deaths Initiative is 5.9 skilled health professionals per 1000 population (WHO 2016a, p.10).

³¹ For background papers to the WHO (2016) report, see Cometto, et.al. (2016) and Liu, et.al. (2017). Cometto, et.al. (2016) forecasts (based on 165 countries with sufficient data to develop projections) growing demand for health workers is to result in 40 million additional health workers in health occupations globally by 2030, but most concentrated in high- and upper middle income countries. The study estimates this points to a shortage of 18 million additional health workers to meet SDGs and universal health coverage targets, with most of the shortage pertaining to low- and lower-middle income countries. Liu, et.al. (2017) projects that the global demand for health workers (again on the basis of 165 countries) to meet universal health coverage targets (again on the basis of 4.45 health workers per 1000 population) will be at 80 million, but supply (if current trends persist) will be at 65 million, pointing to a shortage of 15 million workers.

The additional three and a half million workers, beyond the estimation by WHO (2016) of 14.5 million stem from a recent projection of shortages for the OECD countries by Tomblin Murphy, et.al. (2016a). This study, in turn, is based on a thorough review of over 200 documents estimating future supply versus needs-based requirements for health workers in the OECD countries by Tomblin Murphy, et.al. (2016b). The review shows that the conclusions of the various studies differ widely depending on the methodology used and the assumptions made. While some project surplus of health workers over and above the need, other estimates point to substantial shortages. The review concludes with identification of a set of criteria that needs to be met in conducting projections of human resources for health.

In particular, the follow-up study by Tomblin Murphy, et.al. (2016a) proposes a minimum criterion to project human resource requirements for health in 32 high-income OECD countries into 2030. The health worker requirements, which are limited to doctors, nurses and midwives, are estimated on the basis of self-assessed health status by age and sex for each country, derived from service requirements aligned with health system objectives for each country, and also considering the impact of labour saving technological change on productivity. Supply, on the other hand, is measured in terms of the time devoted to service delivery, accounting for flow and stock. The resulting simulation results suggest that if current conditions of human resources for health persist into 2030, an overwhelming majority of countries will suffer from shortages of health workers in one or more categories (doctors, nurses and midwives) given their increased health care needs. In total, it is estimated that there will be a shortage of 754 thousand doctors, 1.1 million nurses and 45 thousand midwives by 2030 (Tomblin Murphy, et.al. 2016a; Table 2).

In defining the high road scenario for health care, we use a two-pronged approach following WHO (2016) and Tomblin Murphy (2016a) (Table 4). Out of the 45 countries included in our simulation, 34 are high or upper middle-income OECD countries, which do not exhibit a shortfall of health workers by the WHO (2016) threshold, which is 4.45 health workers per 1000 people. This density is designed to project the needs and shortages of the low- and middle-income countries, based on a short list of diseases as explained above. For these 34 countries, we use the shortages of health workers reported in Tomblin (2016a) by country and by profession (doctor/nurse/midwife). For the remaining eleven countries, including China and India, the two countries with the largest populations, as well as Argentina, Indonesia, Mexico, Philippines, Peru, Poland, Tunisia, Turkey and Vietnam, we use the health worker-to-population density estimated by WHO (2016).

Non-health (support) staff employed in the health sector is estimated using employment data provided by ILO GED on health care workers non-health care workers employed in the health sector by country to compute the ratio of number of non-care professionals required to support each care professional. The average ratio for the 45 countries included in the simulation was 0.355 with some variation across countries.

WHO (2016) uses available ‘other cadres’ data to estimate, for each World Bank-defined income level, a cadre multiplier that, when multiplied by the total number of physicians and nurses/midwives in that country, provides the estimate of “all other cadres” supply. This process yields the following multipliers disaggregated by income

level of the country (see p.11): high income (0.373), upper middle income (0.406), lower middle income (0.549), and low income (0.595). Since majority of the countries in our analysis are either high or upper middle income, rather than imposing a given ratio, we were able to introduce country-level variations in our analysis. For the estimation of non-health worker employment in the sector, the ratio of the non-care workers to healthcare workers derived from the ILO data is multiplied to the number of health care workers from the WHO data, and yields the total direct employment.

- **Costing of Health Care Services**

The WHO Global Health Expenditure Database³² provides regional as well as some country level and internationally comparable data to be used in the costing of health care services, such as total government expenditure devoted to health services as well as the share of government health expenditure paid in wages and salaries to health workers. Accordingly, the average national percentage of total government expenditure devoted to health was 11.7% in 2014. Regionally, the average share of health in public expenditures ranged from 8.8% in the WHO Eastern Mediterranean Region to 13.6% in the WHO Region of the Americas (WHO 2017, p.32).³³

As for share of salaries and wages in government health expenditures, a typical country spends 42.2 percent of total government health expenditures to cover salaries of personnel (WHO 2006; p.7). Yet there is variation amongst the regions, with the lowest share of health worker salaries in government expenditures in Africa at 29.2 percent and the highest in at 50.8 percent in Eastern Mediterranean.

We use health expenditure per health worker as the costing parameter. The WHO data provides the number of health care workers as well as total health expenditure by country. We use this source to calculate the health expenditure per health worker for the base year. The data also contains the projected supply and the need of health workers in 2030, whose difference yields shortage of health workers in some countries. The product of the expenditure per health worker and the projected supply of health workers yields total health expenditure by country for the status quo scenario (status quo expenditures in 2030 in 2015 prices). For the high road scenario, the projected shortage of health workers are added to the supply and the total health expenditure is computed. For the OECD countries, a separate projection of health worker shortages reflecting different medical needs of those countries is added to the supply, and the total expenditure is computed.

The average pay per health worker is already at reasonably high levels not only above the minimum wage but also en par with average wage levels in most countries; hence no revisions are made in costing under the higher road scenario in terms of higher wages.

³² <http://apps.who.int/nha/database/Select/Indicators/en>

³³ These represent unweighted averages of country-specific data from WHO Global Health Expenditure Database [online database]. Geneva: World Health Organization. http://www.who.int/gho/publications/world_health_statistics/2017/en/

- **Labour-saving technological change**

Labour-saving technological change is factored into simulation of both scenarios in the case of health, as on the basis of recent trends, further productivity increases are likely to take place in the health sector (Liu 2016; Tomblin, et.al. 2016a and b). Beyond labour saving, it is expected that technical change would have positive impact on care quality as well as on improved working conditions. In other words, technological advances are likely to improve the productivity of the health workers (or the teachers in the education sector), with limited effect of replacing direct care workers (for instance, facilitating more check-ups and surgeries done, teachers using computers in a classroom). Based on these considerations, a 10 per cent reduction of non-health workers employed in the health sector is applied in all countries, compared to what they would be without the labour saving technology. It should be noted that labour saving technological change is also implicit in the health worker shortages for the 34 OECD countries, where the data comes from Tomblin, et.al. (2016a). As was mentioned earlier, increased productivity was one of the parameters of the Tomblin et.al. (2016) model used in the estimation of shortages of health workers.

- **Gender decomposition of employment**

An estimation of the gender distribution of the employment generation is based on gender-disaggregated employment data by country and sector provided by ILO GED. Similar to the case of the education simulation, the female employment ratio of the health sector is used for gender decomposition of direct employment. For gender decomposition of indirect employment, the female employment ratio net of the health and social work sector is used.

Table 4 – Health Care Sector - High road vs. Status Quo Parameters

Parameters	Health Short-term patient care		Long-term Care	
	SQ	HR	SQ	HR
Coverage	Prevailing as of 2015	Universal	Prevailing as of 2015	12.4%
Beneficiary to Health/LTC worker ratio	Prevailing as of 2015	Min 4.45 health care workers per 1000 population (WHO SDG index threshold) and higher*	Prevailing as of 2015	Prevailing as of 2015
Employment : Salaries of Health care/ LTC workers	Prevailing as of 2015	Prevailing as of 2015	Prevailing as of 2015	Wage gap between nurses and personal care workers reduced by a half; wages of personal care workers set at a minimum of statutory wages if lower
Labour-saving technological change	10% reduction of non-health care workers employed in the health sector	10% reduction of non-health workers employed in the health sector + Adjustment for health care professionals as per Tomblin (2016)	non-care workers employed in the LTC sector not included	non-care workers employed in the LTC sector not included

* WHO (2016) SDG index threshold applies to lower income countries (shortages of health care workers estimated by WHO 2016) while for higher income OECD countries meeting the index value, shortages are estimated by Tomblin et.al. 2016a.

III.B. Simulation Results on Health Care

For 34 out of the total of 45 countries, which are in the high or upper middle-income status, the shortages of health workers estimated by Tomblin (2016a) by country are used. For the remaining eleven countries, including China and India, the two countries with the largest populations, as well as Argentina, Indonesia, Mexico, Philippines, Peru, Poland, Tunisia, Turkey and Vietnam, we use the health worker shortages reported by WHO (2016) based on the threshold health worker-to-population density as discussed above. The high-road scenario is designed so as to eliminate these shortages by 2030.

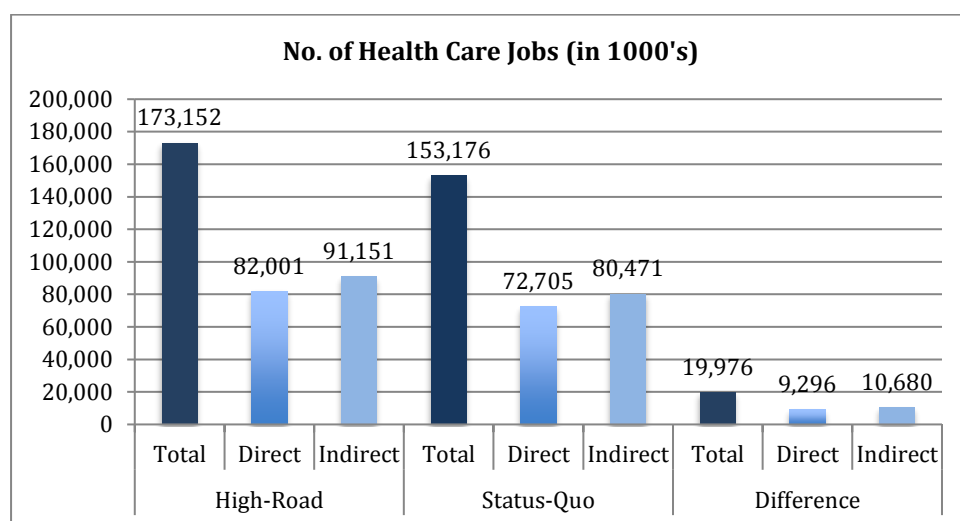
The computations show that the status quo densities in all these eleven countries fall short of the high road target. This is the source of the global difference between necessary health expenditures and employment generation under the status quo and the high road scenarios. (Supplementary Tables: Health) Under the status quo scenario, where the health worker-to-population densities remain constant to 2030, the total health care expenditures are estimated to be about 10.4 trillion USD (in 2015 prices) (Table 5). To achieve the SDG targets the estimated magnitude of total expenditures is at 11.3 trillion USD; hence increasing health expenditures from 10.3 percent of GDP to 11.3 percent. Hence the high road scenario requires an approximately 10 percent (964 billion USD) increase in spending to ensure meeting of SDG targets.

Table 5 – Health Care Sector: Employment Generation and Expenditures under the High road vs. Status Quo Scenarios

	Health (short-term ill/patient care)			Long-term Care (older persons' care)			Total		
	SQ	HR	Difference (%)	SQ	HR	Difference (%)	SQ	HR	Difference (%)
Cost (required expenditures in trillion USD 2015 prices)	10.38	11.34	0.96 (9.3)	1.11	2.35	1.23 (111)	11.49	13.69	2.2 (19)
Cost as share of GDP (%)	10.3	11.3	1.0	1.1	2.3	1.2	11.4	13.6	2.2
Fiscal Returns as share of expenditures (%)							18.2	17.9	
Direct employment (1000's)	72,705	82,001	9,296 (13)	20,970	50,792	29,822 (142)	93,675	132,793	39,118 (42)
Indirect employment (1000's)	80,471	91,150	10,679 (13)	3,151	13,895	10,744 (341)	83,622	105,045	21,423 (26)
Total employment (1000's)	153.176	173.151	19,975 (13)	24,121	64,687	40,566 (168)	177,297	237,838	60,541 (34)

The high road simulation shows that increasing expenditures as such towards the SDG targets on health creates 173 million jobs in the health sector and in other sectors through backward linkages. This is 13 per cent more than the number of jobs created under the status quo scenario (153 million jobs) if health worker ratios are to remain constant (Figure 5). Of the additional jobs (the difference between the high road and status quo scenarios, a total of 20 million jobs), 9.3 million are direct jobs (in the health sector) and 10.7 million are indirect jobs (in sectors other than health). Similar to the case for education, the difference in the number of direct jobs in health care between the two scenarios is smaller (9.3 million jobs) than the difference in the indirect jobs (10.7 million jobs).

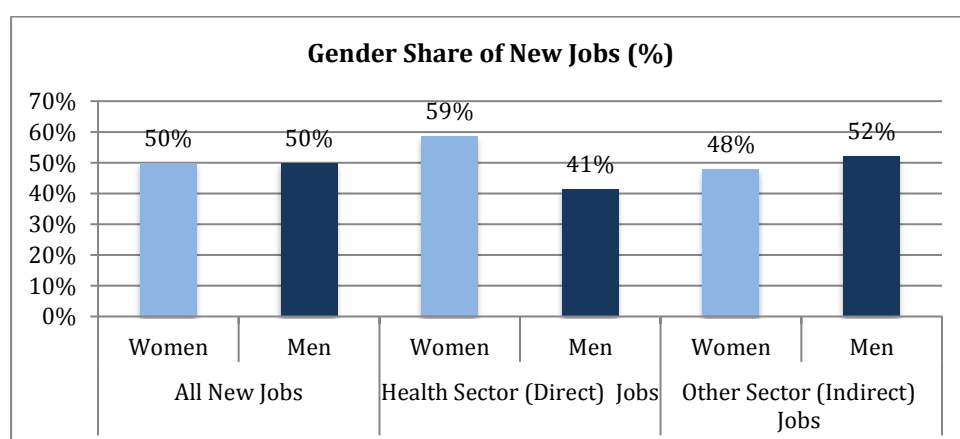
Figure 5: Jobs Generation in Health Care by Direct and Indirect Jobs



This shortage of 9.3 million jobs entails 6.5 million health care professionals and the rest are support (non-care) workers in the health sector. The shortage reported in the Dublin declaration of 18 million workers is on a global scale and includes only health professionals. Hence this estimation, which is on the basis of 45 countries, makes up about one third of this global projection (Supplementary Tables: Health).

The gender distribution of additional jobs created, are balanced with the additional jobs being equally shared between women and men. Women's share in new direct jobs created in the health care sector is higher at 59 per cent, while men's share is slightly higher at 52 per cent in new indirect jobs. Similar to the education scenario, underlying is the occupational gender segregation.

Figure 6: Distribution of Additional Employment in Health Care by Gender



III.C. Long-term Care

- **A background based on existing quantitative assessments of LTC shortages**

Long-term or rehabilitative care to older persons or people with disabilities entails a large variety of services, and at a minimum entail those that assist people with basic daily living activities, such as eating, bathing, dressing, mobility in or outside of the house, support with basic healthcare ranging from medication, health monitoring, doctor's visits to pain management and wound dressing, etc. A wider definition of LTC also entails supporting these basic daily living activities with secondary services such as shopping, cooking, cleaning and other necessary housework.

Provisioning of these LTC services take place in a number of organizational structures as follows (Lipszyc, et.al. 2012; Gardiner and Hussein 2015):

- institutional care - formal services provided in an institutional setting such as
 - residential nursing homes, or
 - day centres (semi-residential care);
- home care - formal professional services provided in a home-based setting;
- informal paid care - services by domestic workers in a home-based setting;
- unpaid care - services by family and friends; and

The first two types of provisioning can be defined as in-kind LTC coverage. Most countries also provide cash benefits to households with dependents in need of LTC, which can be used to pay for informal care by domestic workers or function as some form of compensation for informal services by family and friends providing LTC to household members.

In most countries, the need for LTC is addressed to a large extent through informal unpaid services by family and friends. Even within the context of the higher-income UNECE countries (35 countries with available data), with relatively developed LTC services, only seven have LTC coverage above 50 percent of the dependent 65+ population (i.e. at least half receive care benefits in kind or in cash) (Rodrigues 2012). A recent survey of EU-27 has found that in 13 countries, more than 50% of LTC coverage is based entirely on unpaid care services inside the household (Lipszyc, et.al. 2012, p.16, graph 5). It should also be noted that different modes of paid LTC provisioning is to a large extent complimented by informal unpaid care. So the question is to what extent formal paid services are available not to completely substitute for informal unpaid care but to partly substitute and largely complement it.

Generally speaking high-income countries have relatively extensive institutional coverage of LTC, yet most are moving away from (residential) institutional care towards home-based paid care and semi-residential day care (Rodrigues, et.al. 2012; Colombo, et.al. 2011). In most of UNECE countries with high LTC coverage rates, a substantial part of coverage is through home-based services (Colombo et.al., p. 40; Lipszyc, et.al. 2012, p.16).

Data is of very limited availability for most countries but sporadic quantitative and qualitative evidence suggests that for middle- and low-income countries LTC coverage

is very low and a strong familialism prevails such that LTC is provided overwhelmingly by family members. A survey of households with dependent older family members in Peru, Mexico, China and Nigeria reports that use of paid care arrangements were under 5% with more than 90 per cent of care being provided by family members. The exceptions were urban households in Lima and Beijing, where 33 per cent and 45 per cent of households respectively used paid carers (informal paid services by domestic workers); and the rest depended on unpaid family care (Mayston, et.al. 2014). Lloyd-Sherlock and Nedendo (2017) report for Argentina based on national survey that as much as 95% of dependent older persons rely on family members as their main provider.

Scheil-Adlung (2015) provides the only existing global estimation on LTC needs and shortages. The study is based on most recent data for the period 2006-2014 from 46 developed and developing economies. Starting from an assessment of the extent of overreliance on family members for LTC in majority of the countries, the study presents an estimation on the deficits in financing and employment of formal LTC workers. The threshold for the employment deficit is set at 4.2 formal LTC workers per 100 population aged 65 or above. This is derived as a population weighted median of OECD countries with available data. It is suggested that since “OECD countries do not rate the availability of LTC workers as satisfactory” (p.24), this density can be assumed as a minimum threshold. Against this threshold value, the results suggest an approximate shortfall of 13.6 million formal LTC workers as of 2013, over and above the existing employment of 11.9 million formal LTC workers. Almost three quarters of the shortfall originates from Asia and the Pacific.

In terms of public financing of LTC, Scheil-Adlung (2015) reports that the share of GDP spent on LTC ranges from a maximum of around 2 per cent in a number of high-income OECD countries (reaching a maximum of 2.3 per cent in Norway), to a minimum of almost no public financing in a whole range of countries: 12 out of the 46 countries included in the analysis either do not report statistics on public spending on LTC or have nil; 12 countries spend less than 0.5% of GDP including China and India where only 0.1 per cent of GDP is allocated. Based on a population weighted median per capita expenditure from 34 countries with available data on different forms of financing, the study suggests a threshold of 1,461 PPP USD (in 2013 prices) per person aged 65 or above, against which to assess financing deficits.

LTC targets and costing are set and the simulation results are evaluated against the background of these recent assessments as explained in the rest of this section.

- **Setting the LTC target coverage rate**

There are no internationally or regionally agreed on specific policy targets on LTC in terms of coverage rates. In identifying a high road target LTC coverage rate, the approach adopted is similar to the one in ECCE and take the high-performing countries as a point of reference. High-performance on LTC is defined as full legal access to LTC support in the form of services or cash benefits as defined in Scheil-Adlung (2015). There are nine OECD countries that have such legislation on entitlement to universal coverage; namely, Belgium, Czech Republic, Denmark, Germany, Iceland, Japan, Luxembourg, South Korea, and Sweden. Data on share of the population aged 65 and

above receiving long-term care in institutional and home-based context is available for all these countries with the exception of Iceland. The population weighted average of LTC recipients is 12.4 per cent (See Appendix IV for country level data and a detailed explanation). This average does not include cash benefits for LTC and hence is a lower bound coverage rate for these universal legal coverage countries. The high road LTC coverage rate is set at this lower bound of 12.4 per cent (Table 4).³⁴

- **Costing**

LTC expenditure per LTC beneficiary is used as the costing parameter. The analysis does not distinguish institutional from home-based LTC, because the cost information is available as the total in most countries. The number of formal LTC beneficiaries and total expenditure on LTC from the OECD health statistics form the basis of the method. Noting that not all older population would require or use the care service, a status quo coverage rate is computed as a division of the number of beneficiaries by total population aged 65 and above. Due to incomplete nature of the data for all OECD countries, supplementary reference (Rodriguez 2012) is used to complete the calculation of the coverage rate for Canada and Japan. For the non-OECD countries, no direct information is observed in the data to compute the coverage rate. There are 11 such countries in our analysis, and imputation of the missing values is conducted for low-middle income countries (per capita GDP less than 4,000 USD- Indonesia, India, Tunisia, and Viet Nam) and others separately. For the former group of countries, the minimum observed coverage rate from the OECD countries, valued at 0.7 percent of the old-age population in Turkey, is assigned. For the latter group of countries, the coverage rate, at the 5th percentile, of 1.67 percent is assigned (See Supplementary Table: Health). The cost estimation method under the high road scenario is the same as in the case of status quo.

For the high road scenario, the guideline for the coverage rate is 12.4 per cent of the old-age population as explained above, and it is applied to the countries whose current rate is less than the guideline. The coverage rate is multiplied to the projected population of aged 65 and above in 2030 to compute the number of LTC beneficiaries in the case of the status quo. The total cost of LTC becomes the product of the projected number of beneficiaries to the per-beneficiary cost.

The number of direct LTC care workers is the product of the projected beneficiaries to the number of care workers per beneficiary from the OECD. The imputation of missing values is done by taking the median value of the observed countries, which is 0.31, or 3 beneficiaries per care worker. It is assumed that long-term care is a labour-intensive activity and the care production technology is more or less homogenous across countries. As a reference point, the values at the 25th and 75th percentiles are 0.31 and 0.37 respectively, further supporting our imputation method. The density for SQ and HR are the same.

The wage gap between nurses and personal care workers is reduced by a half and the

³⁴ A recent projection by Hu (2012) of Chinese disabled old-age population finds the disability rates to range between 2.2 to 24.4 percent among the old age population. Disability rates for older population (defined as aged 60 and above) in India are assessed to range between 6 per cent (Veleiyutham, et.al. 2016) to 16% (Chakrabarty *et al.*). These figures support the claim for 12.4 per cent coverage rate among population aged 65 and above.

high road costs are adjusted up accordingly. Using the wage data on associate nurses and personal care workers in health services from 15 countries, the missing values are imputed with the median value by income level of a country. The wages are compared to the statutory wages, and 3 countries (Brazil, Poland, and Russia) are found to have the wages lower than the statutory one. They are replaced with the statutory one, and the wage gaps are computed. The half of the gap is multiplied to the estimated number of personal care workers in order to get the additional wage costs as a result of the wage increase for the personal care workers. The additional wage costs are added to the original high road costs.

- **Indirect Employment and Labour-saving technological change**

The number of non-LTC care workers in LTC sector is not estimated as there is no available data. Given the labour intensive nature of the LTC, the number may be small. Hence by excluding non-care workers in LTC, the results here represent a lower bound. As such there is no scope for introducing a labour-saving technology component in the LTC simulation, as was done under non-care jobs in health care services. An estimation of non-direct care workers employed in the LTC sector for the 45 countries included in the analysis yields employment of 23 million additional workers. Since this estimation relies heavily on imputed values, they are not included in the results.

The introduction of labour-saving technology to direct LTC employment was considered as an option given the recent emerging discussions on the topic. However, a review of literature suggests that labour-saving technological options in LTC are very limited and still remain controversial in terms of service quality trade-offs. There is some evidence from spearheading countries regarding new initiatives, such as tele-home-care (Canada), screen-to-screen communication, and monitoring via videos and sensors (the Netherlands), emergency care technology (Czech Republics) (Colombo, et.al. 2011). Wider use of such technological advances is assessed to improve quality of care for the recipients as well as of employment conditions, rather than replacing the direct caring labour. Moreover, to the extent that they are labour-replacing, the question remains as to whether such productivity improvements via technology and work re-organization are compatible with quality enhancement goals (as in the case of health care and education discussed earlier).³⁵ Therefore there is no assumption of labour-saving technological change in direct care LTC employment. Yet the exclusion of non-care workers employed in the LTC sector from the employment estimates yields a lower bound (Table 4).

III.D. Simulation Results on Long-term Care

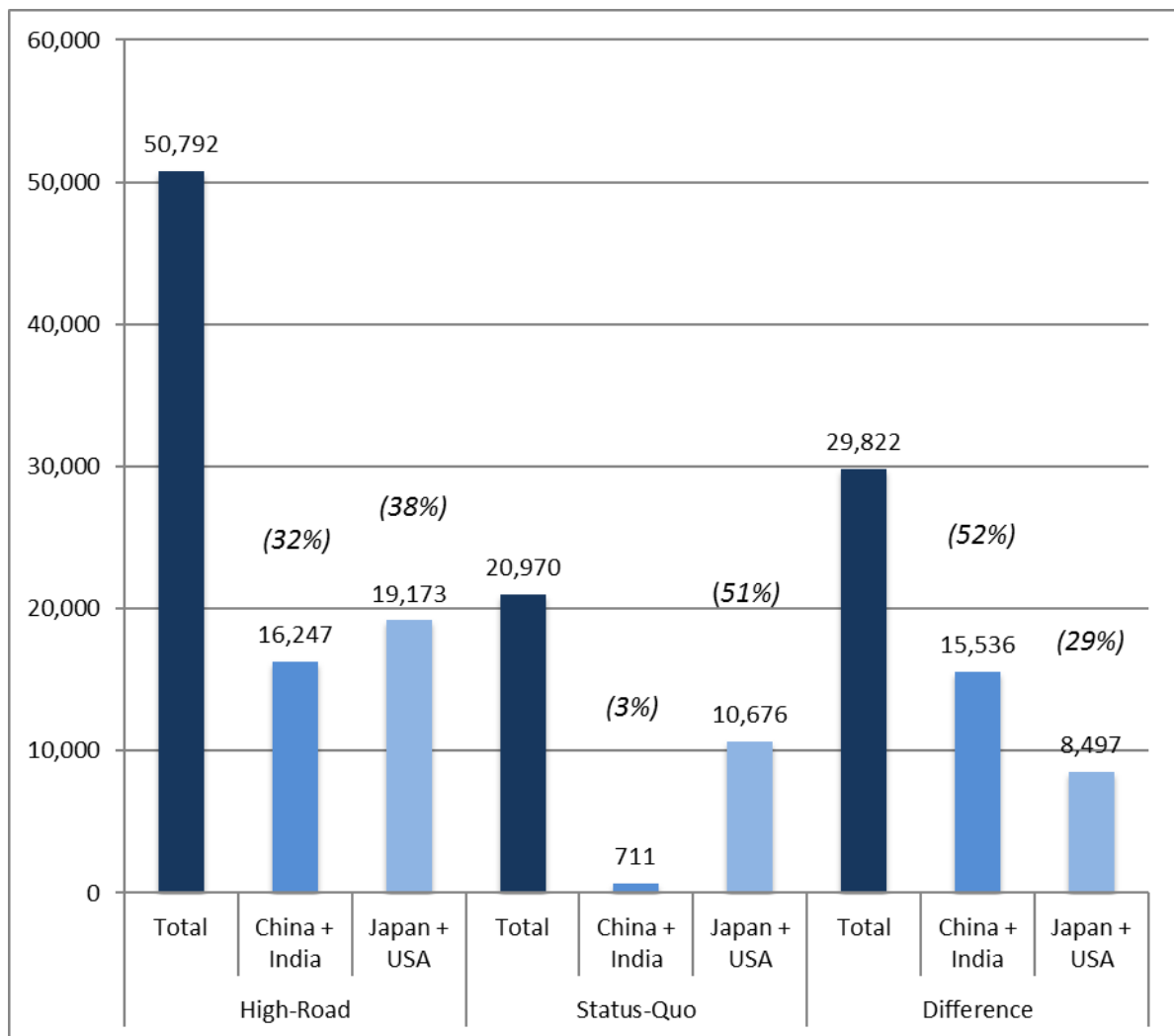
The magnitude of LTC spending under the high road scenario, which foresees a higher coverage rate and better wages for personal LTC workers, is 2.35 trillion USD versus 1.11 trillion USD under the status quo scenario (Table 5). This corresponds to an increase of public LTC spending from only 1.1 per cent of total GDP of the countries included in our analysis under the status quo, to 2.3 per cent of GDP in order to meet the high road targets.

³⁵ See Colombo, et.al. (2011) p.206-208 for a discussion.

The direct employment generation under the status quo is estimated at 21 million formal LTC workers as of 2030, whereas under the high road LTC employment is estimated at more than three times higher at 50.8 million (Figure 7). Hence meeting the high road targets in terms of LTC coverage as well as beneficiary per LTC worker ratios is expected to create almost 30 million additional jobs.

More than half (53 per cent) of this additional employment is due to China and India alone. Beyond their sheer population size, the aging population in China and current shortfalls LTC coverage in India result in their relatively large share in new LTC jobs. Japan and the USA are the other two countries that drive the results, by their aging population and sheer size respectively. They account for 29 per cent of total additional LTC employment.

Figure 7: Jobs Generation in LTC (in 1000's) and Country Shares (%)



Indirect employment in other sectors (other than health and LTC) as facilitated by LTC spending, is 3 million jobs under the status quo and 14 million jobs under the high-road scenario (Table 5). This effect is instigated by the overall health care sector multiplier since IO tables do not present LTC as a separate sector; LTC is aggregated as part of the health care sector.

IV. Expansion of Employment Estimates to Cover other Categories of Education and Health Care Workers and Comparison to the Current (2015) Sectoral Employment Levels

An important caveat regarding the education and health employment estimates reported above, pertains to the fact that employment in these sectors are not necessarily limited to the categories which served as the basis of these estimates. In education for example, direct employment estimation focused on teachers in the formal school system. Employment in education, however, entails also other workers such as tutors, recreational teachers and trainers, staff of educational institutions other than schools

such as test or study centres, curriculum and material development and publishing establishments. In the case of health care, direct employment estimation was limited to health care workers as defined by WHO (namely, doctors, nurses, midwives and “other cadres”) plus long-term care workers. A major category that has been omitted was that of social workers, which is often reported as part of the sectoral aggregate of health and social work (HSW).

The reason for the omission of these categories is because the foregoing analysis defined the simulation parameters within the SDG framework, where formal school teachers and health care workers constitute the main reference categories of care workers. Hence education sector employees outside of the formal school system or social workers and related employees in the health sector were not part of the analysis. The omission, however, makes it impossible to have a meaningful interpretation of the 2030 status quo and high road estimates in comparison to 2015 employment levels. The sectoral employment statistics from household labour force surveys (HLFS) are aggregates, which entail these additional categories of education and HSW workers. Hence they are not comparable to the narrower estimates of 2030 employment reported above for education and health care.

In order to enable such a comparison, it is possible to expand the 2030 estimates of care employment so as to capture these additional categories. This is done through a comparison of 2015 HLFS-based education and HSW sector care worker employment (provided by ILO GED for the 45 countries included in the simulation) to our own estimates of narrowly defined care worker employment in each sector in 2015. For the latter, the same methodology is used as in the status quo scenario only applying it to 2015 population figures. The difference between the two series provides a magnitude of care worker employment in additional categories not included in our estimates.

For example, the difference between 2015 HLFS-based education sector care worker employment and our estimates of teacher employment in the formal school system in 2015, provides the number of additional categories of education care workers. This is proportioned to the younger school age population to derive the number of additional education sector employment per child (student) population. Applying the ratio to the estimated child (student) population in 2030, it is estimated that a total of 28.5 million additional care workers in education are to be employed in categories other than teachers in the formal school system. Applying the non-care worker to care worker ratio per country, we find a total of 8.9 million additional support workers in the 45 countries. In the case of HSW, additional sectoral employment in 2030 constitutes 23.2 million care workers (for most part social workers) and 9.3 million non-care workers.

Moving on from here, it becomes possible to present a more comprehensive estimation of overall sectoral employment in 2030 under the status quo and high-road scenarios; and also compare them to the current (2015) sectoral employment. As far as the education sector is concerned (Figure 8a), total employment in the 45 countries as of 2015 stands at 107 million (82 million care workers entailing not only formal school teachers but also other categories and 25 million support workers). Under the status quo, where the education sector expands along with population change and demographic transformations into 2030, but keeps the current enrolment rates and student to teacher ratios constant, education employment is expected to increase to 121.5 million. This small increase in education sector employment of 13.6 percent is

not surprising in view of the fact that the overall school-age population in the 45 countries is estimated to decline by about 2.6 percent from 2015 to 2030 (Figure 9). Nevertheless, some large countries which are expected to see the increase in younger age groups (such as Argentina, Australia, Canada, Russia, Turkey, the U.S., and Viet Nam) drive the increase in direct employment in the education sector even under the status quo scenario.

The high-road scenario, on the other hand, estimates that the education sector employment has the potential to increase by as much as 50 percent to 161 million workers in 2030 (Figure 8a). Beyond the increase in child population in some countries, this is driven by improved enrolment rates, particularly in ECCE. Of the difference of 56.7 million additional jobs in education between the high road and status quo scenarios, 20.4 million are created due to increasing ECCE enrolment (Table 2a), corresponding to 36 percent of additional job creation under education. The other contributors to additional job creation under the high road are improved student to teacher ratios as well as improved enrolment rates at primary, secondary and tertiary levels of schooling.

Figure 8a: Education Sector Employment (1000's of Jobs) - 2015 vs. 2030 Status Quo and High Road Scenarios

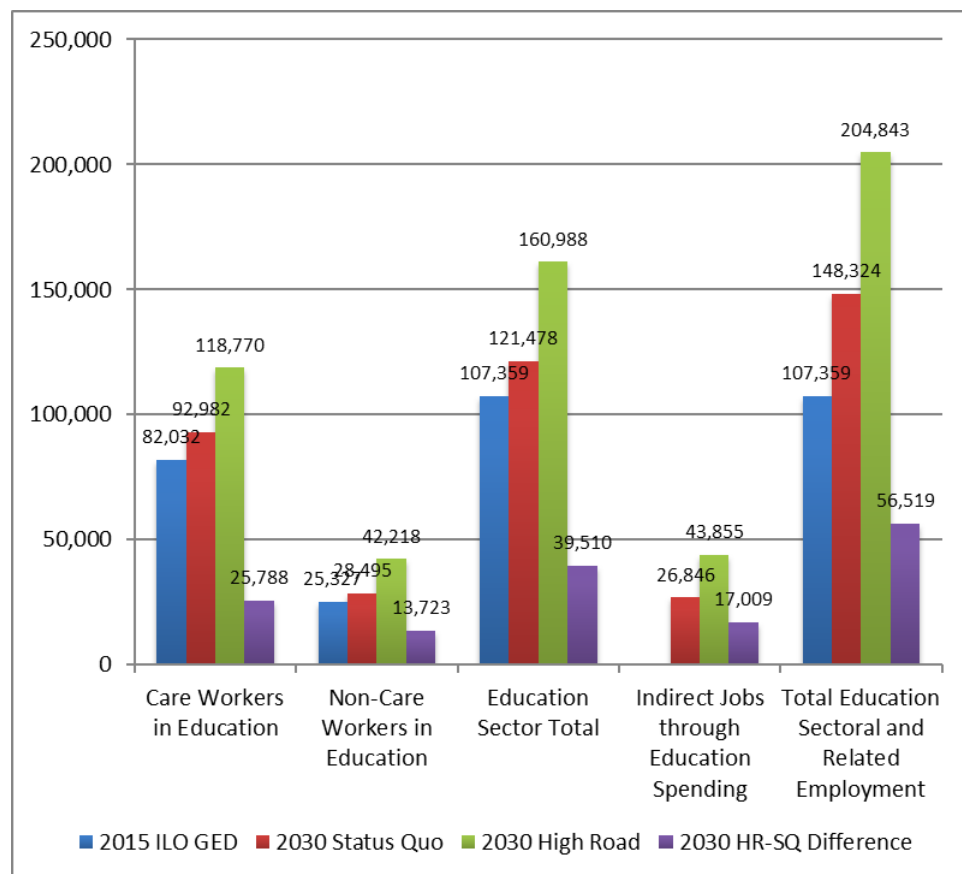
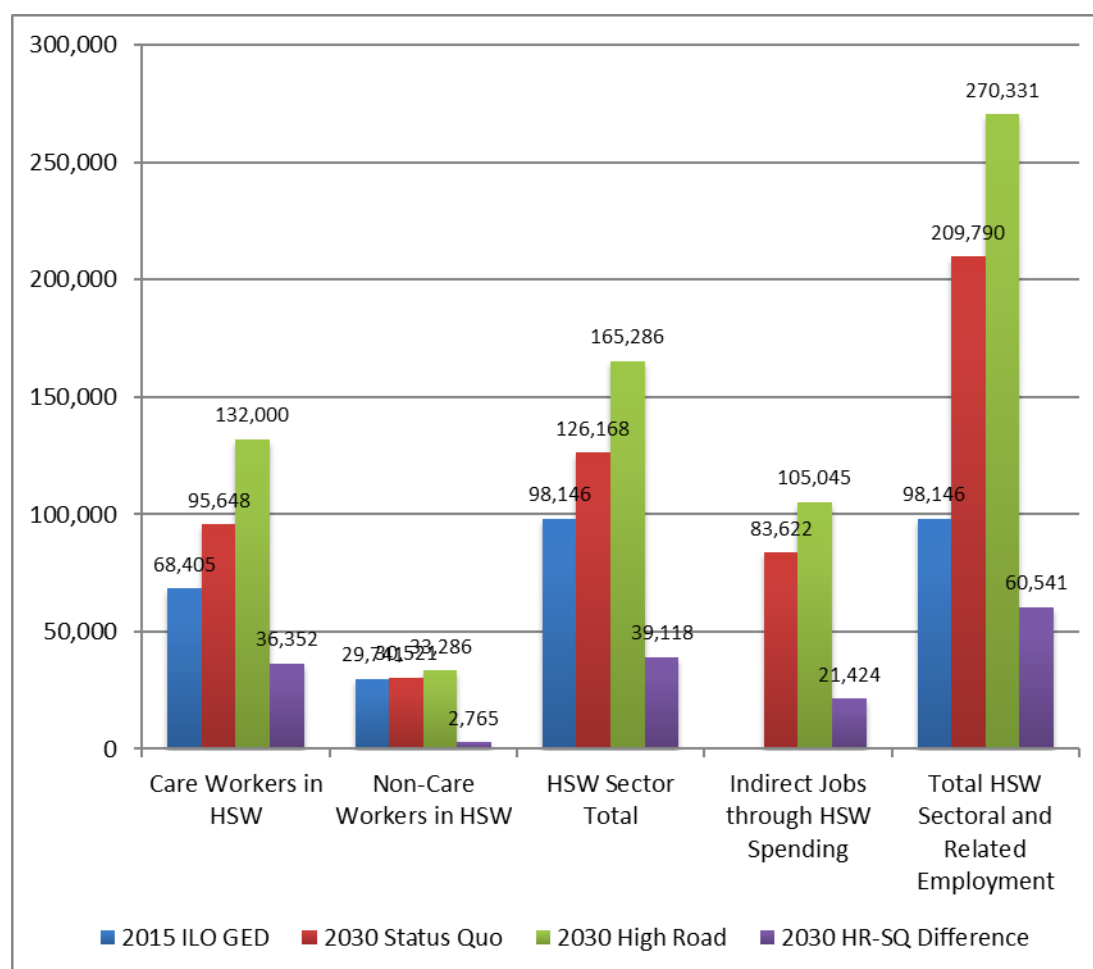


Figure 8b: Health and Social Work Sector Employment (1000's of Jobs) - 2015 vs. 2030 Status Quo and High Road Scenarios

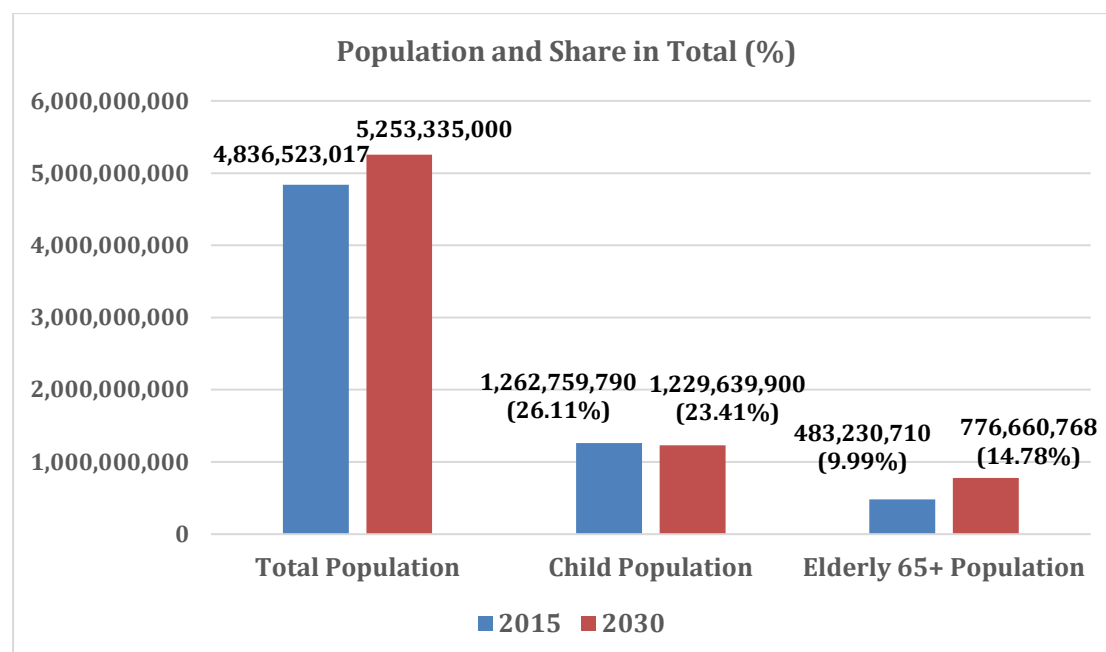


As for the HSW sector (Figure 8b), total employment in the 45 countries in 2015 stands at 98 million (68.4 million care workers entailing now also social workers and 29.7 million support workers). Under the status quo, where the HSW sector expands along with population change and demographic transformations into 2030, but keeps the current coverage rates and service provider to beneficiary ratios constant, HSW employment is expected to increase by more than a quarter to 126.1 million workers. The increase is driven simply by overall population increase, which is 8.6 percent for the 45 countries in the analysis (Figure 9).

Following the high-road scenario, however, it is estimated that sectoral employment has the potential to increase by as much as 66 percent to 165.3 million workers in 2030. Beyond population increase, this is driven by demographic transformation towards aging (as the older population increases by a phenomenal 61 percent) and improved coverage rates in LTC as foreseen in the high road simulation. Of the additional job creation in the HSW sector under the high road over and above the status quo – total of 60.5 million extra jobs, half (30 million jobs) are LTC care workers.

The indirect job creation in both cases is similar to the previous estimates as the analysis does not entail a separate estimate for associated spending.

Figure 9: Population and Demographic Change in the 45 Countries included in the Analysis



V. Promoting Formal Care Services and the Effects on Domestic Worker Employment

Given the limited availability of formal care options both for childcare and long-term care, there is substantial reliance on care provided in home settings. This care comprises the unpaid care work by family, friends, volunteers; or paid work by domestic workers, most of whom are employed informally and face poor work conditions (ILO 2018; D’Souza 2010). Improving accessibility of services provided by formal care workers in institutional settings might be expected to substitute for some of the care work undertaken by on an unpaid basis by family and friends, and on a paid basis by informally employed domestic workers. This would be less than a perfect substitution, given the complementarities between the two types of care work.

To the extent that formal care work substitutes for unpaid care work, it relieves some of the burden on unpaid carers as service providers, while expectedly improving quality of life for the children, the ill and older persons on the service-receiving end. Increasing formal care employment would also replace to some extent paid domestic workers’ employment. Some of the domestic workers (presumably relatively higher-skilled ones) would be transformed from informal to formal care workers, while for some others there might be a displacement effect. If this were the case, increasing public expenditures to promote formal care workers would result in a lower net employment effect than has been reported above.

The potential loss in domestic employment can be accounted for through a trade-off analysis between formal care employment vs. informal paid care employment (i.e.

domestic workers). An accurate analysis would need to be based on data differentiating domestic worker employment that is specifically for the purpose of direct childcare, ill care or long-term care versus household work. Yet such data is of limited availability. Moreover, one should ideally control for unobserved individual- and family-level, as well as cross-country, heterogeneity. Given the data limitation, only the cross-country heterogeneity over time is accounted for in a panel analysis. An analysis of the trade-off between domestic worker employment and overall total care employment (including all education and health & social work employees) was undertaken using data provided by ILO-GED for 2015 (31 countries) and 2011 (29 countries).

A scatter diagram showing the distribution of the share of domestic workers in total employment versus share of formal care workers based on 2015 and 2011 data exhibits an apparent negative correlation for both years (Figure 10a and b).

Further to cross-section data for each year, Figure 10c shows the differences in the shares of these two types of workers. Using the available data from two years is expected to account for unobserved cross-country heterogeneity. In this case, the data on change in formal care employment versus change in domestic worker employment (Figure 10c) does not exhibit the negative correlation observed between the simple shares of employment for each year (as in Figures 10a and b).

Figure 10a: Formal Care Employment (Education and Health & Social Work) vs. Domestic Worker Employment as share of Total Employment, 2015

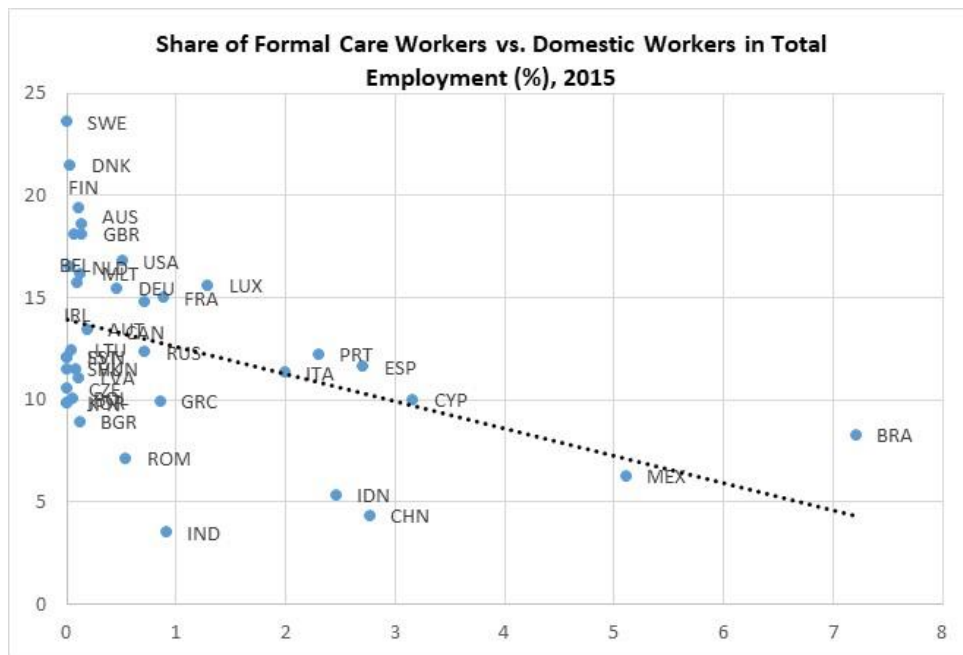


Figure 10b: Formal Care Employment (Education and Health & Social Work) vs. Domestic Worker Employment as share of Total Employment, 2011

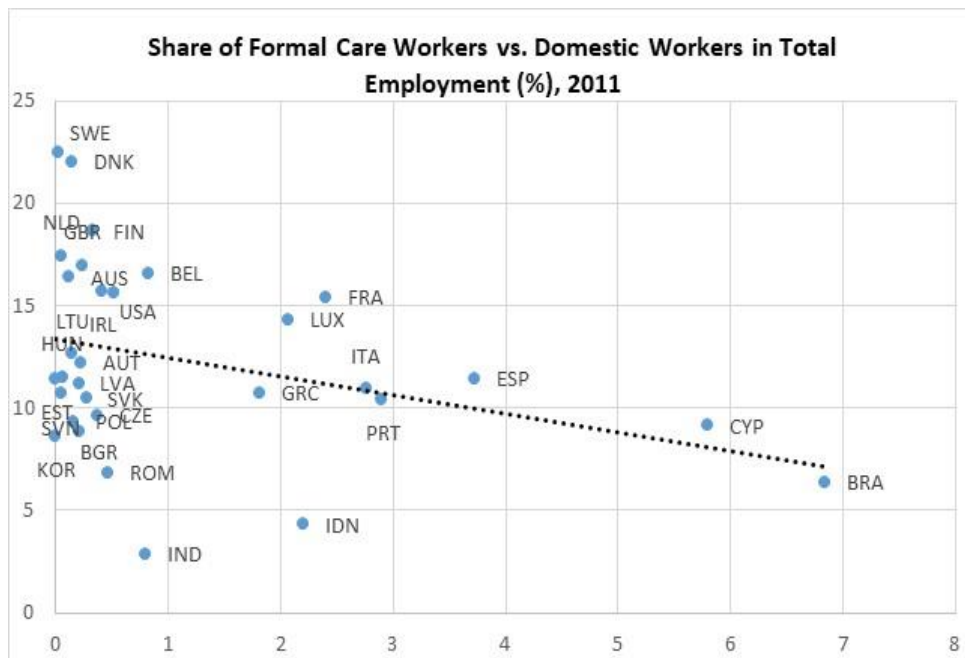
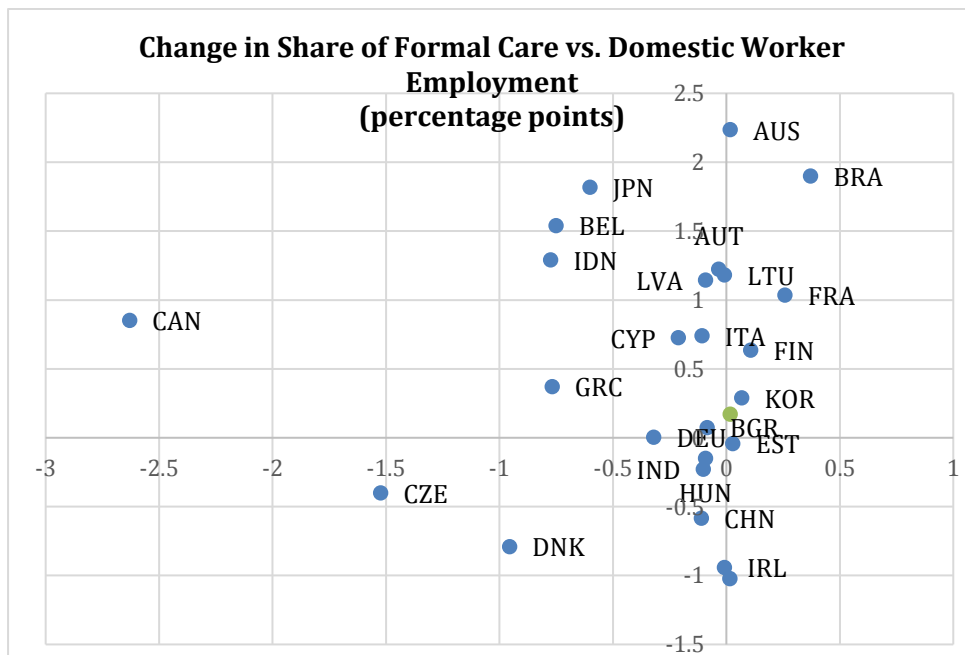


Figure 10c: Change in the Share of Formal Care Employment (Education and Health & Social Work) vs. Domestic Worker Employment from 2011 to 2015



Within the limitations of available data, a series of regression analyses were conducted with and without country-level control variables, which yield mixed results (Table 6).

The dependent variable is share of domestic worker employment in total employment, and the main independent variable of interest is share of formal care employment in total employment.

Table 6 – Regression Analysis of the Trade-off between domestic worker and formal care employment

	Cross-section (2015) w/out control variables	Cross-section (2015) w/ control variables	Pooled cross- section (2011 and 2015) w/ control variables	Panel (fixed effects) w/out control variables	Panel (fixed effects) w/ control variables
Coefficient on formal care employment (<i>s.e.</i>)	-0.116* (0.048)	-0.082 (0.104)	-0.046 (0.037)	-0.147 (0.145)	0.024 (0.78)
Control Variables**	None	Yes	Yes	None	Yes
Adj. R2	0.1372	0.2297	0.1973	0.1979	0.0108
No. of observations	39	18	37	60	27

* Statistically significant at 5%.

** The control variables used are the share of LTC beneficiaries as share of 65+ population, log of per capita GDP, health expenditure as share of GDP, and 65+population as share of total population, ECCE enrolment rates and the annualized minimum wages as a share of annual average earnings.

A simple cross-section without control variables based on 2015 data finds a statistically significant negative coefficient in line with expectations. Yet when a set of control variables is included, statistical significance is lost while the coefficient remains negative. The control variables included the share of LTC beneficiaries as share of 65+ population, log of per capita GDP, health expenditure as share of GDP, and 65+ population as share of total population, ECCE enrolment rate and the annualized minimum wages as a share of annual average earnings.³⁶ Given that including control variables leads to loss of more than half the observations, a pooled cross-section with 2011 and 2015 data was also conducted. Again, the coefficient on formal care employment is negative but without statistical significance. A fixed effects panel regression, to account for unobserved country effects, yields a negative coefficient without control variables, and a positive coefficient with control variables but both statistically insignificant.

The lack of statistical significance might be due to limited number of observations and quality of data. An ideal treatment of the question at hand would require an analysis of the trade-off between the change in domestic worker employment that is directed at childcare, ill care and long-term care versus the change in formal ECCE workers and LTC workers.

Beyond data limitations, there are two possible explanations as to why a weak relationship is observed between the change in domestic worker employment and the change in formal care employment. The increase in formal care workers might cater predominantly to replacing informal unpaid (family) labour rather than paid domestic work. This follows from the fact that access to public provisioning of formal care in

³⁶ Trials with the Gini coefficient included amongst the control variables did not change the results.

majority of countries is restricted to the poorest parts of the population by conditions based on narrow income means and needs-tests. For instance, in terms of access to publically provisioned formal LTC services, Scheil-Adlung (2015) reports that while 48 percent of the world's population is not covered by any national legislation, 46.3 percent is largely excluded from coverage due to narrow means-testing regulations, and only 5.6 per cent of the global population lives in countries that provide universal access to LTC coverage based on national legislation. Hence the conditions of access force persons aged 65+ in need of LTC to become poor before they become eligible for LTC services. Hence tracing any substitution effect would become possible only in an environment of universal coverage.

Moreover, to the extent that domestic workers compliment direct care work (caring for children and older persons) through production of supporting indirect care services (cleaning, shopping, cooking, household management), those households with the ability to pay would continue to employ domestic workers even in the case of increasing accessibility of formal care workers providing direct care services in institutions. Therefore a more appropriate unit of analysis could be the change in hours of employment (or full-time equivalent employment) and intensity of work of domestic workers rather than the simple of headcount ratio used here.

VI. An Assessment of Fiscal Revenues and Feasibility

The fiscal sustainability of increased public spending on formal care services is one of the primary questions of interest. This can be explored in terms of the estimated increase in revenues as a ratio of the required public expenditures for care expansion towards meeting the SDGs. Such estimation can be undertaken through tracing the GDP increase as a result of increased expenditure on formal care using input-output analysis and the revenue to GDP ratios for each country.

The injections (expenditures) are multiplied to output multipliers of corresponding industries by country, which yields the increases in Gross Output.³⁷ (GO). The increase in GO is multiplied to the ratio of GDP to GO by country which converts the output increases into GDP increases. They are then multiplied to the tax-to-GDP and revenue-to-GDP ratios that yield the tax and total revenue in us dollars. Then the amounts are compared to injections and GDP 2015. The taxes include all kinds of taxes, such as income, property, corporate, VAT and others under the category "taxes", which is a part of "revenue". The revenue is the higher classification than taxes in that it also includes non-tax revenue, such as social contributions, and any other government receipts (such as stamp revenue and fees, other than grants). The main component is social contributions from both employees and employers.

It is estimated that tax returns make up approximately 10.5 percent of initial outlays of expenditures. Adding revenues other than taxes, the total fiscal return rises to 17.4 percent of initial outlays of expenditures overall. There is little difference in terms of revenues as share of injection between the high road and status quo scenarios because

³⁷ The fiscal revenue assessment covers 44 countries; Brunei is missing as there is no revenue information for this country in the World Bank database.

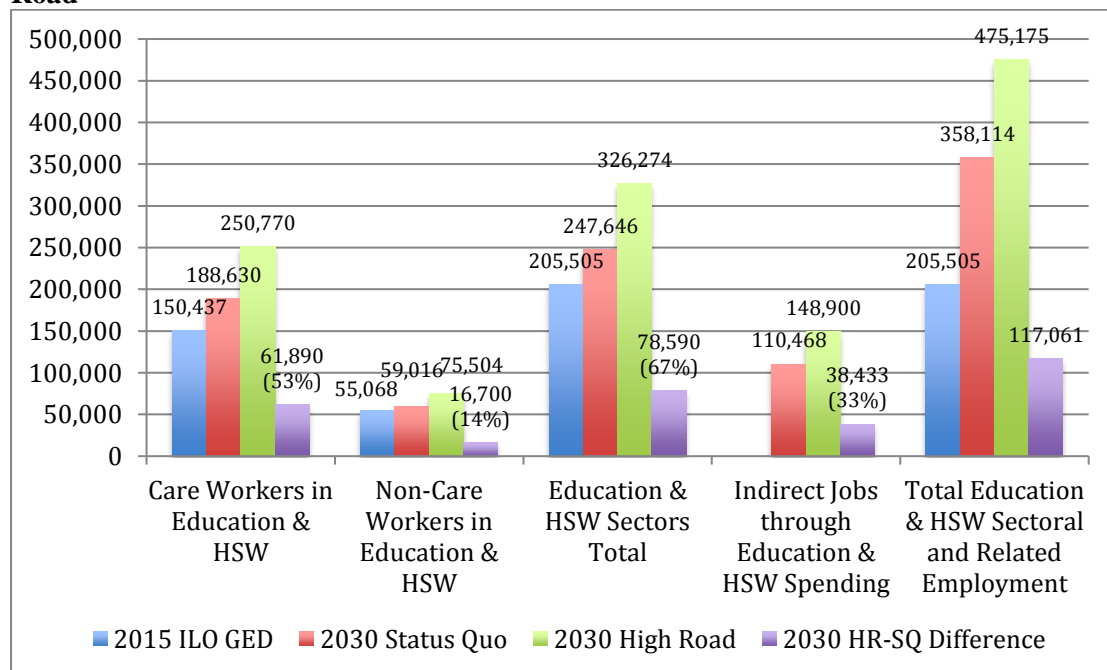
the tax and revenue ratios are constant in both scenarios. A micro data-based tax-benefit microsimulation on the other hand might yield different results as it could account for individual-level heterogeneity that may generate disproportionate changes in taxable income and income tax rates.

For example, a country-level assessment on Turkey using more disaggregated data reports fiscal returns to increased spending on ECCE at 26 percent (Ilkcaracan and Kim 2018), while in the current exercise the fiscal returns on education for Turkey are assessed at 21.6 percent. It should be noted that if the employment simulation were to include induced effects as well, the fiscal returns would be assessed even higher. The study on Turkey finds that, including the induced effects (hence higher employment generation), fiscal returns have the potential to go up to 39 percent.

VII. Conclusion

The combined results for education, health care and long-term care implies that increasing public investments in the care economy so as to meet SDG targets by 2030 carries a substantial potential for employment creation. As far as the 45 countries included in this analysis are concerned (representing 85 per cent of global GDP and close to 60 per cent of global population and workforce), meeting multiple SDG targets on education including formal childcare, health and long-term care along with gender equality and decent jobs, carries the potential for generating a total of 117 million additional jobs (Figure 11). This would increase total care and care-related indirect employment to a total of 475 million workers; a 33 per cent increase over the status quo scenario where total care and care-related indirect employment is expected to be 358 million workers under a business-as-usual scenario.

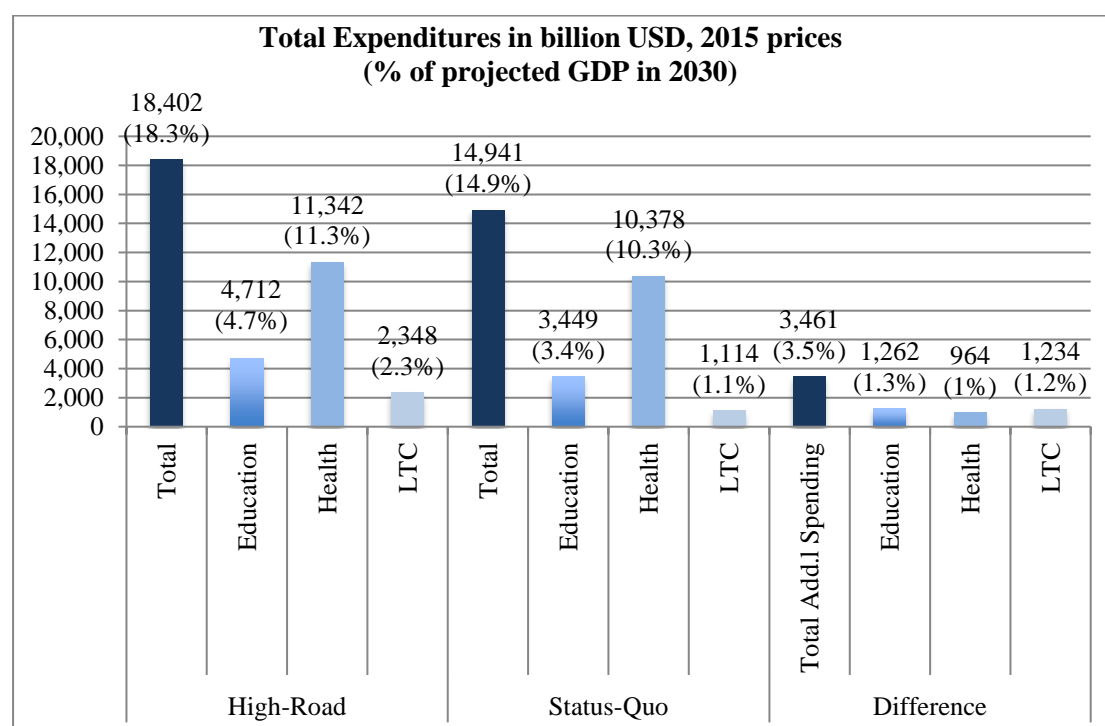
Figure 11: Total Care and Related Employment – 2015 vs. 2030 Status Quo and High Road



Of the total additional 117 million jobs, 61.9 million (53 percent) are care workers and 16.7 million (14 percent) are support workers. Totalling to 78.6 million jobs, 67 percent of additional jobs creation (the difference between the high road and the status quo) is due to sectoral employment. As was presented above, ECCE and LTC, with 20.4 and 29.8 million new jobs respectively, are the largest contributors to this additional sectoral employment creation. These two areas of improvement constitute 43 percent of total additional job creation. This is followed by health care with approximately 10 million new health care sector jobs. The jobs generation potential is further strengthened by creation of 38.4 million new jobs in other sectors through backward linkages. These indirect jobs constitute a non-negligible share (33 percent) of additional job creation. It should be noted these employment estimates entail two biases in opposite directions. On the one hand, indirect job creation is underestimated in that the input-output analysis did not include induced employment effects to be triggered through increased household consumption spending. The number of additional indirect jobs (38.4 million) represents a lower bound estimate of job creation in other sectors.

On the other hand, as discussed earlier, the increasing access to formal care services in education including ECCE, health and long-term care is likely to come at the expense of informal domestic worker employment. Some higher qualified informal domestic workers are likely to be transformed into formal care workers, while some of the lower qualified lose employment opportunities, and a certain level of informal domestic worker employment is likely to remain as complimentary to formal care. Such a trade-off between formal care employment and informal domestic worker employment, however, has not proven to be a strong one in light of the foregoing analysis based on limited data from a few countries. The lack of a robust finding regarding a trade-off between formal care employment and informal domestic worker employment might possibly underlie a different type of trade-off: Expansion of formal care might cater predominantly to replacing informal unpaid (family) labour rather than paid domestic work. This follows from the fact that access to public provisioning of formal care in majority of countries is restricted to the poorest parts of the population by conditions based on narrow income means and needs-tests.

Figure 12: Total Care Expenditures by Sector



Under a business-as-usual scenario, total care spending (public plus private) by 2030 would remain at 14.9 trillion USD, corresponding to 14.9 percent of the combined total projected GDP of the 45 countries in 2030 (Figure 12).³⁸ Hence even maintaining the current state of affairs in education and health requires a substantial increase in spending from its current 8.7 percent of GDP (for the 45 countries included in this analysis as of 2015) to 14.9 percent of projected GDP in 2030. This increase is driven by population increase and primarily demographic transformation, particularly increasing health and long-term care costs.

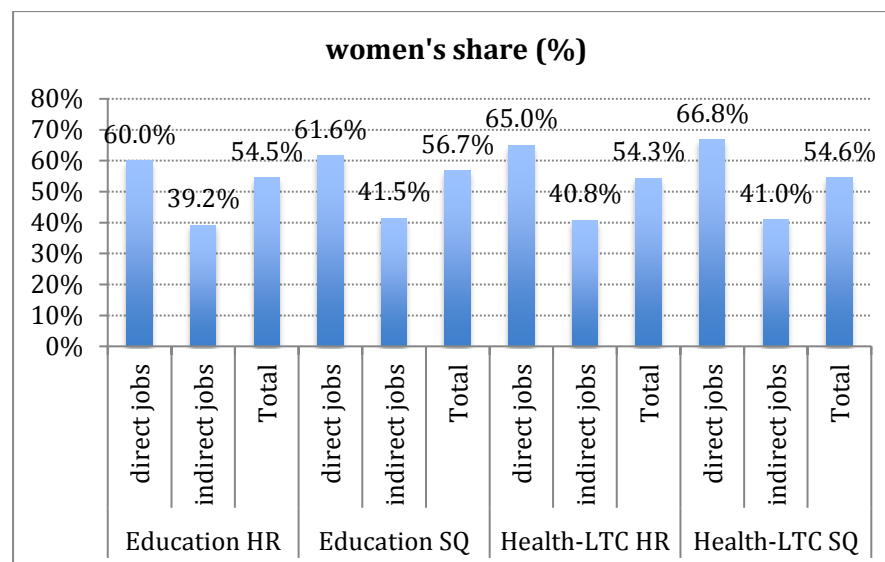
Realizing the high road scenario would result in total care expenditures of 18.4 trillion USD (public plus private), corresponding to about 18.3 percent of total projected GDP of the 45 countries in 2030. In other words, meeting the SDGs in education and health so as to close the care deficits, calls for additional spending corresponding to 3.5 percentage points of projected GDP in 2030. Of this additional spending, 1.3 percentage points is due to additional expenditures on education, 1 percentage point is due to additional expenditures on health and 1.2 percentage point is due to expenditures on long-term care for older persons. It is estimated that at a minimum 17.5 per cent of additional public spending would be recovered in the short-run through fiscal revenues.

The difference of 3.5 percentage points of projected GDP in 2030 contributes towards two objectives simultaneously (Tables 1 and 4): Primarily achieving the enrolment rates in education (ECCE through tertiary education) as well as the coverage rates of the

³⁸ 2030 GDP projections are based on the IMF's real GDP growth, annual percentage growth (http://www.imf.org/external/datamapper/NGDP_RPCH@WEO/OEMDC/ADVEC/WEOWORLD). The series contains the growth rate up to 2020, and were extrapolated to 2030 by extending the 2020 growth rate.

overall population in health care and older population in long-term care so as to meet the targets foreseen by SDG 3 (education for all) and 4 (healthcare for all). In addition, it ensures that this happens under decent work conditions at least as far as sectoral employment is concerned. Teachers in ECCE through primary and secondary education receive salaries en par with national standards. Health care workers maintain their already decent wage levels; and long-term care workers receive at least minimum statutory wages or higher, whereby the gap with wages of nurses are reduced by half.

Figure 13: Women’s Share in Total Employment



Women’s share in direct employment is 60 percent and 65 percent in the education and health sectors respectively under the high-road scenario (Figure 13). Their share in indirect employment is lower in both cases at around 39 to 41 percent. Interestingly, the high road female shares are slightly lower than those under the status quo. As far as total employment is concerned women’s share is 55 and 54 percent in the education and health sectors respectively under the high-road scenario, and 57 and 55 percent under the status quo.

The analysis demonstrates that the investment in quality care services can be a strategic policy intervention to enhance women’s economic empowerment through creating gainful employment opportunities. Such a labour demand side effect of investing in care work would further strengthen gender equality outcomes of social care expansion on the labour supply side, i.e. reducing the unpaid care work load and relieving the time constraints on women. It also carries a potential to alleviate unemployment by generating jobs not only in the female-friendly care sector but also throughout the rest of the economy benefiting male workforce as well. These positive impacts can be even greater when the care workers are paid fairly for their services; more children are educated in better conditions; and more people have access to medical and long-term care.

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Appendix I: SDGs, Global and Thematic Indicators on Education³⁹

- **Primary and Secondary Education**

SDG 4.1: By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes.

GLOBAL INDICATOR 4.1.1 – *Per centage of children and young people: (a) in grades 2/3; (b) at the end of primary; and (c) at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex*

THEMATIC INDICATOR 2 – *Administration of a nationally representative learning assessment (i) during primary, (ii) at the end of primary and (iii) at the end of lower secondary education*

THEMATIC INDICATOR 3 – *Gross intake ratio to the last grade (primary, lower secondary)*

THEMATIC INDICATOR 4 – *Completion rate (primary, lower secondary, upper secondary)*

THEMATIC INDICATOR 5 – *Out-of-school rate (primary, lower secondary, upper secondary)*

THEMATIC INDICATOR 6 – *Per centage of children over-age for grade (primary, lower secondary)*

THEMATIC INDICATOR 7 – *Number of years of (i) free and (ii) compulsory primary and secondary education guaranteed in legal frameworks*

- **Early Childhood Development and Pre-Primary Education**

SDG 4.2: By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education.

GLOBAL INDICATOR 4.2.1 – *Proportion of children under 5 years of age who are developmentally on track in health, learning and psychosocial well-being, by sex*

GLOBAL INDICATOR 4.2.2 – *Participation rate in organized learning (one year before the official primary entry age), by sex*

THEMATIC INDICATOR 9 – *Percentage of children under 5 years of age experiencing positive and stimulating home learning environments*

THEMATIC INDICATOR 11 – *Gross pre-primary enrolment ratio*

THEMATIC INDICATOR 12 – *Number of years of (i) free and (ii) compulsory pre-primary education guaranteed in legal frameworks*

- **Teachers and Quality of Education**

SDG Target 4.C: By 2030, substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least developed countries and small-island developing States

GLOBAL INDICATOR 4.C.1 – *Proportion of teachers in: (a) pre-primary; (b) primary; (c) lower secondary; and (d) upper secondary education who have received at least the minimum organized teacher training (e.g. pedagogical) pre-service or in-service required for teaching at the relevant level in a given country*

³⁹ Source: UNESCO Global Education Monitoring Report 2016

THEMATIC INDICATOR 37 – Percentage of teachers qualified according to national standards, by education level and type of institution

THEMATIC INDICATOR 38 – Pupil/qualified teacher ratio, by education level

THEMATIC INDICATOR 40 – Pupil/trained teacher ratio, by education level

THEMATIC INDICATOR 41 – Average teacher salary relative to other professions requiring a comparable level of education qualification

THEMATIC INDICATOR 42 – Teacher attrition rate, by education level

THEMATIC INDICATOR 43 – Percentage of teachers who received in-service training in the last 12 months, by type of training

- **Tertiary Education**

SDG Target 4.3: By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university

GLOBAL INDICATOR 4.3.1 – *Participation rate of youth and adults in formal and non-formal education and training in the previous 12 months, by sex*

THEMATIC INDICATOR 13 – *Gross enrolment ratio for tertiary education*

THEMATIC INDICATOR 14 – *Participation rate in technical-vocational education programmes (15- to 24-year-olds)*

Appendix II: Setting of ECCE Policy Target for 0-2 age Group⁴⁰

In setting the target for early childhood development (at 50 per cent coverage rate) for children in the 0-2 years old age group, we follow the best performing countries in this area. The “best performing countries” are defined as the ones with the lowest levels of use of informal childcare, and therefore the ones that can be safely assumed to have close to full coverage. Based on OECD data, the countries with lowest use of informal childcare are shown in Table A.II.1.

Table A.II.1 – Countries with lowest use of informal childcare, 2014

Country	(%) of children using informal childcare arrangements during a typical week, 0-2 year olds
Norway	5.2
Finland	2.2
Sweden	0.3
Denmark	0.0

Source: OECD Family Database, Data for Chart PF3.3.A. <http://www.oecd.org/els/family/PF3-3-Informal-childcare-arrangements.xlsx>

In these countries, the use of formal childcare services for age group 0-2 are shown in Table A.II.2:

Table A.II.2 – Formal Childcare in countries with lowest use of informal childcare, 2014

Country	2011	2012	2013	2014	2015	Population 2015 thousands
Denmark	67.5	67.7	67.1	65.2	..	5 689
Finland	28.5	28	28.2	27.9	..	5 482
Norway	55.1	54.8	54.8	54.7	..	5 200
Sweden	47.9	48.2	47.6	46.9	..	9 764
Average	49.5	49.5	49.2	48.4		

Source: OECD Family Database, ++
http://www.oecd.org/els/soc/PF3_2_Enrolment_childcare_preschool.xlsx

The population-weighted average for 2011-2014 is in the range of 48.4% (2014) and 49.5% (2011-2012). Hence following these best performing countries, we set the ECCE high road target for early childhood development at 50% coverage for children in the 0-2 year old age group.

⁴⁰ Prepared by ILO GED.

Appendix III: SDGs, Global and Thematic Indicators on Health

Goal 3. Ensure healthy lives and promote well-being for all at all ages

3.1 By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births

- 3.1.1 Maternal mortality ratio
- 3.1.2 Proportion of births attended by skilled health personnel

3.2 By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births

3.2.1 Under-5 mortality rate

3.2.2 Neonatal mortality rate

3.3 By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases

3.3.1 Number of new HIV infections per 1,000 uninfected population, by sex, age and key populations

3.3.2 Tuberculosis incidence per 100,000 population

3.3.3 Malaria incidence per 1,000 population

3.3.4 Hepatitis B incidence per 100,000 population

3.3.5 Number of people requiring interventions against neglected tropical diseases

3.4 By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being

3.4.1 Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease

3.4.2 Suicide mortality rate

3.5 Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol

3.5.1 Coverage of treatment interventions (pharmacological, psychosocial and rehabilitation and aftercare services) for substance use disorders

3.5.2 Harmful use of alcohol, defined according to the national context as alcohol per capita consumption (aged 15 years and older) within a calendar year in litres of pure alcohol

3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents

3.6.1 Death rate due to road traffic injuries

3.7 By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes

3.7.1 Proportion of women of reproductive age (aged 15–49 years) who have their need for family planning satisfied with modern methods

3.7.2 Adolescent birth rate (aged 10–14 years; aged 15–19 years) per 1,000 women in that age group

3.8 Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all

3.8.1 Coverage of essential health services (defined as the average coverage of essential services based on tracer interventions that include reproductive, maternal, newborn and child health, infectious diseases, non-communicable diseases and service capacity and access, among the general and the most disadvantaged population)

3.8.2 Proportion of population with large household expenditures on health as a share of total household expenditure or income

3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination

3.9.1 Mortality rate attributed to household and ambient air pollution

3.9.2 Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene (exposure to unsafe Water, Sanitation and Hygiene for All (WASH) services)

3.9.3 Mortality rate attributed to unintentional poisoning

3.a Strengthen the implementation of the World Health Organization Framework Convention on Tobacco Control in all countries, as appropriate

3.b Support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on Trade-Related Aspects of Intellectual Property Rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all

3.c Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States

3.d Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks

3.a.1 Age-standardized prevalence of current tobacco use among persons aged 15 years and older

3.b.1 Proportion of the target population covered by all vaccines included in their national programme

3.b.2 Total net official development assistance to medical research and basic health sectors

3.b.3 Proportion of health facilities that have a core set of relevant essential medicines available and affordable on a sustainable basis

3.c.1 Health worker density and distribution

3.d.1 International Health Regulations (IHR) capacity and health emergency preparedness

Appendix IV: Setting of the LTC Policy Target⁴¹

In setting the high road scenario target for LTC coverage, we follow the best performing countries in this area. The “best performing countries” are defined as the ones with 100 per cent legal coverage for LTC needs. It is presumed that providing full legal right to LTC implies better health services for population aged 65 and over.

The countries that have full LTC legal coverage are as follows (Scheil-Adlung 2015): Belgium, Czech Republic, Denmark, Germany, Iceland, Luxembourg and Sweden in Europe, and Japan, and South Korea Asia. For these countries, the LTC coverage rates are provided below by type of coverage, namely institutional and home-based services (with the exception of Iceland for which data is not available):

Table A.IV: LTC recipients as % of total population aged 65 years old and over (circa 2010-2016)

Country	LTC Recipients in institutions (other than hospitals)	LTC Recipients at home	Total LTC recipients
Belgium	8.8	-	8.8
Czech Republic	2.3	11.2	13.5
Denmark	3.9	11.6	15.5
Germany	3.8	7.6	11.4
Japan	4.8	10.3	15.1
Korea	2.5	4.4	6.9
Luxembourg	5.5	7.6	13.1
Sweden	4.5	11.8	16.3
Population weighted average			12.4

Source: The coverage rates are from OECD LTC database () for the year 2015 or 2016 with the exception of the Czech Republic, where data source is from Rodriguez et.al. (2012) for the period 2009-2011; and Germany and Japan from Gori, et.al. (2015) for the year 2012.

The population weighted average of persons 65+ benefitting from institutional or home-based formal care is 12.4%, which sets the target LTC coverage rate for the high-road scenario. Note that cash benefits are not included, hence 12.4% is a lower bound coverage rate for these 100% legal coverage countries.

⁴¹ Prepared by ILO GED.

Appendix V: Data tables

Table A.V Employment generation in 2015, in 2030 under the high road and status quo scenarios

	Number of jobs (thousands)																							
	2015						2030 High Road									2030 Status quo								
	Number of jobs (thousands)						Number of jobs (thousands)									Number of jobs (thousands)								
	Education		Health and Social Work		Education and Health and Social Work		Education			Health and Social Work			Education and Health and Social Work			Education			Health and Social Work			Education and Health and Social Work		
Country	Care workers	Non-care workers	Care workers	Non-care workers	Care workers	Non-care workers	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs
Argentina	931	331	670	54	1600	385	1238	331	68	1145	309	155	2383	640	224	945	316	53	816	289	118	1761	604	171
Australia	829	241	1289	431	2118	672	842	292	143	1849	476	318	2690	768	461	790	230	118	1672	423	245	2462	653	362
Austria	233	52	328	102	561	154	229	113	22	456	102	158	685	215	180	201	45	18	438	102	154	639	147	172
Belgium	353	79	467	218	820	296	403	119	14	547	189	106	950	308	120	382	85	13	461	159	87	843	244	100
Brazil	4642	1975	3156	1526	7798	3501	5105	2490	1726	5299	1752	4428	10404	4243	6154	4376	1862	1326	4049	1752	4114	8425	3614	5440
Brunei Darussalam	14	4	4	0	18	5	16	6	1	8	2	4	24	8	5	14	5	1	6	2	4	20	6	4
Bulgaria	134	39	130	31	265	70	173	71	35	198	29	78	371	101	113	152	44	24	149	29	70	301	73	94
Canada	912	396	1707	582	2619	978	1025	370	195	2090	557	626	3115	927	822	917	398	164	2013	533	560	2930	932	724
China	20813	4735	12045	6460	32858	11195	25270	7362	14925	28230	8776	51728	53499	16138	66653	22478	5114	13421	17143	8297	41222	39621	13410	54643
Cyprus	34	6	20	8	54	14	49	12	3	37	10	6	85	22	9	45	8	3	27	10	6	72	18	8
Czech Republic	244	89	273	82	517	171	268	112	33	406	75	122	673	187	155	256	94	27	364	64	102	620	158	130

	Number of jobs (thousands)																							
	2015						2030 High Road									2030 Status quo								
	Number of jobs (thousands)						Number of jobs (thousands)									Number of jobs (thousands)								
	Education		Health and Social Work		Education and Health and Social Work		Education			Health and Social Work			Education and Health and Social Work			Education			Health and Social Work			Education and Health and Social Work		
Country	Care workers	Non-care workers	Care workers	Non-care workers	Care workers	Non-care workers	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs
Denmark	188	56	394	79	582	134	209	96	45	493	70	99	703	166	144	188	56	38	446	62	81	634	117	119
Estonia	43	14	31	8	74	21	56	15	6	55	7	12	110	22	18	51	16	4	36	5	8	87	21	12
Finland	137	36	349	59	485	95	176	61	28	360	49	46	536	111	75	162	43	23	358	49	46	520	92	69
France	1489	516	2531	1355	4019	1870	1615	653	152	3432	1368	562	5047	2021	714	1463	507	139	3059	1241	472	4522	1747	611
Germany	2117	508	3966	1195	6082	1703	2133	904	267	5176	1164	1770	7309	2068	2037	1967	472	219	4965	1107	1602	6932	1579	1821
Greece	252	40	160	56	411	96	306	66	20	348	73	131	654	138	151	272	43	16	202	62	102	474	106	117
Hungary	237	81	207	70	444	150	282	114	19	229	55	51	511	170	70	249	85	15	229	55	51	478	140	66
India	12802	2403	3249	1794	16050	4197	30009	7029	4881	14355	4283	8866	44364	11312	13747	17972	3373	1072	7014	3339	6736	24985	6713	7808
Indonesia	4877	877	1000	507	5877	1384	9593	2000	10206	3526	1147	5759	13119	3147	15965	6550	1178	3162	1153	539	1849	7703	1716	5012
Ireland	113	36	186	62	299	99	110	47	11	322	72	89	432	118	100	99	32	9	291	63	77	389	94	86
Italy	1144	347	1406	364	2550	711	1149	430	45	2030	308	700	3179	739	745	1070	325	39	1649	252	548	2718	576	587
Japan	1559	1451	4570	3354	6129	4805	1891	1809	291	5525	1630	2560	7417	3439	2851	1536	1430	260	4680	1630	1622	6216	3059	1882
Latvia	60	24	37	18	97	42	70	34	5	50	12	12	120	46	17	66	26	5	37	12	10	102	39	15
Lithuania	90	43	69	21	159	64	103	58	7	91	20	19	194	78	26	99	47	5	70	20	16	169	67	22
Luxembourg	17	2	19	8	36	10	23	5	1	23	10	0	47	15	1	21	3	1	23	10	0	44	13	1
Malta	14	4	13	4	26	8	15	6	1	18	5	3	34	11	4	14	4	1	14	5	2	28	9	3

	Number of jobs (thousands)																							
	2015						2030 High Road									2030 Status quo								
	Number of jobs (thousands)						Number of jobs (thousands)									Number of jobs (thousands)								
	Education		Health and Social Work		Education and Health and Social Work		Education			Health and Social Work			Education and Health and Social Work			Education			Health and Social Work			Education and Health and Social Work		
Country	Care workers	Non-care workers	Care workers	Non-care workers	Care workers	Non-care workers	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs
Mexico	1935	779	1149	486	3084	1265	3370	1627	264	3554	449	719	6924	2076	983	2366	952	182	3541	443	709	5906	1395	891
Netherlands	412	144	980	303	1392	447	450	210	76	1527	358	262	1977	568	338	407	142	59	1487	346	236	1894	489	295
Peru	608	176	353	24	961	200	886	264	69	671	178	193	1557	442	262	697	226	50	455	158	130	1152	383	180
Philippines	868	243	319	187	1188	430	1423	449	3219	1656	412	2873	3078	862	6092	598	225	1635	1290	410	2775	1888	635	4410
Poland	899	370	781	252	1680	622	1044	504	85	1081	229	214	2125	734	298	944	389	73	734	210	133	1678	599	206
Portugal	272	105	307	113	579	218	248	121	19	222	37	132	470	158	151	226	87	17	157	30	111	383	117	128
Republic of Korea	1751	709	649	246	2400	956	1744	880	266	1543	320	703	3287	1200	969	1673	678	231	1291	320	643	2964	998	873
Romania	277	75	334	62	611	137	347	120	38	503	58	145	851	178	183	281	76	27	339	58	118	620	134	146
Russian Federation	4864	1837	4027	1476	8891	3312	5754	2725	1070	5719	1556	3190	11473	4281	4260	5451	2058	821	5306	1556	3109	10757	3614	3931
Slovak Republic	122	51	147	29	269	80	127	63	14	133	22	19	260	85	33	115	48	11	133	22	19	248	70	30
Slovenia	63	19	51	16	114	36	71	28	9	63	10	16	134	38	24	68	21	7	63	10	15	130	30	22
Spain	1000	235	1158	314	2158	548	1015	394	68	1693	290	458	2708	684	526	932	219	57	1571	262	405	2503	481	462
Sweden	448	105	650	83	1098	188	556	164	74	867	69	157	1423	233	232	551	129	72	797	61	127	1348	190	198
Tunisia	217	9	70	46	287	55	280	112	11	215	46	38	495	159	49	217	72	6	147	46	35	364	118	41
Turkey	1060	265	741	357	1801	622	2359	886	205	1556	331	861	3914	1217	1065	1404	446	145	1075	317	741	2479	764	886

	Number of jobs (thousands)																							
	2015						2030 High Road									2030 Status quo								
	Number of jobs (thousands)						Number of jobs (thousands)									Number of jobs (thousands)								
	Education		Health and Social Work		Education and Health and Social Work		Education			Health and Social Wok			Education and Health and Social Work			Education			Health and Social Wok			Education and Health and Social Work		
Country	Care workers	Non-care workers	Care workers	Non-care workers	Care workers	Non-care workers	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs	Care workers	Non-care workers	Indirect jobs
United Kingdom	2333	972	3040	1078	5373	2050	2619	1203	397	3579	933	1563	6198	2136	1960	2441	1017	342	3574	931	1541	6015	1948	1883
United States	9229	4616	15018	6033	24247	10649	12272	7165	3127	29391	5065	14202	41663	12231	17329	10657	5330	2283	21289	4903	12130	31946	10233	14414
Vietnam	1400	233	356	168	1757	401	1848	697	1694	1731	369	891	3579	1066	2585	1620	542	649	1036	326	741	2657	868	1390

Table B.V Country-based costs of the expansion of care services under the status quo (SQ) vs. high road (HR) scenarios

	Education SQ		Education HR		Fiscal returns as share of expenditures (%) in both scenarios	Health and social work SQ		Health and social work HR		Fiscal returns as share of expenditures (%) in both scenarios	Total SQ		Total HR		Fiscal returns as share of expenditures (%) in both scenarios
	Cost (required expenditures in million US\$, 2015 prices)	Cost as share of 2030 GDP (%)	Cost (required expenditures in million US\$, 2015 prices)	Cost as share of 2030 GDP (%)		Cost (required expenditures in million US\$, 2015 prices)	Cost as share of 2030 GDP (%)	Cost (required expenditures in million US\$, 2015 prices)	Cost as share of 2030 GDP (%)		Cost (required expenditures in million US\$, 2015 prices)	Cost as share of 2030 GDP (%)	Cost (required expenditures in million US\$, 2015 prices)	Cost as share of 2030 GDP (%)	
Argentina	29800	3.4	38400	4.4	14.0	34994	4.0	46210	5.3	17.3	64794	7.4	84610	9.7	15.8
Australia	88000	4.4	107000	5.3	16.9	200240	10.0	260320	13.0	16.2	288240	14.4	367320	18.3	16.4
Austria	22500	4.8	27700	5.9	26.7	91170	19.3	93500	19.8	30.3	113670	24.1	121200	25.7	29.6
Belgium	31200	5.5	34300	6.0	20.0	68400	12.0	83600	14.7	24.7	99600	17.5	117900	20.7	23.2
Brazil	129000	5.7	168000	7.5	18.1	275120	12.2	296100	13.1	22.3	404120	17.9	464100	20.6	21.0
Brunei	525	2.0	624	2.4	0.0	655	2.5	777	3.0	0.0	1180	4.5	1401	5.3	0.0
Bulgaria	2410	3.2	3420	4.6	13.9	5656	7.5	6294	8.4	16.3	8066	10.7	9714	12.9	15.6
Canada	90000	4.4	107000	5.2	11.7	250500	12.2	280100	13.7	12.4	340500	16.6	387100	18.9	12.2
China	366000	1.4	407000	1.5	9.9	928380	3.5	1165000	4.4	12.7	1294380	4.8	1572000	5.9	11.9
Cyprus	2420	8.7	2800	10.1	24.9	2802	10.1	3245	11.7	26.3	5222	18.8	6045	21.8	25.6
Czech Republic	9280	3.5	11300	4.3	13.7	25560	9.6	30490	11.5	14.7	34840	13.1	41790	15.8	14.5
Denmark	25400	6.4	30100	7.6	26.6	54100	13.7	66300	16.8	26.7	79500	20.2	96400	24.5	26.6
Estonia	1210	3.4	1660	4.7	1.4	1979	5.6	2988	8.5	1.4	3189	9.0	4648	13.2	1.4
Finland	15000	5.0	18100	6.1	23.8	27890	9.3	28380	9.5	24.3	42890	14.3	46480	15.6	24.1
France	160000	5.1	175000	5.5	27.9	458100	14.5	545700	17.2	28.9	618100	19.5	720700	22.8	28.6
Germany	178000	4.3	217000	5.3	18.8	790000	19.1	872600	21.1	19.2	968000	23.4	1089600	26.4	19.2

	Education SQ		Education HR		Fiscal returns as share of expenditures (%) in both scenarios	Health and social work SQ		Health and social work HR		Fiscal returns as share of expenditures (%) in both scenarios	Total SQ		Total HR		Fiscal returns as share of expenditures (%) in both scenarios
	Cost (required expenditures in million US\$, 2015 prices)	Cost as share of 2030 GDP (%)	Cost (required expenditures in million US\$, 2015 prices)	Cost as share of 2030 GDP (%)		Cost (required expenditures in million US\$, 2015 prices)	Cost as share of 2030 GDP (%)	Cost (required expenditures in million US\$, 2015 prices)	Cost as share of 2030 GDP (%)		Cost (required expenditures in million US\$, 2015 prices)	Cost as share of 2030 GDP (%)	Cost (required expenditures in million US\$, 2015 prices)	Cost as share of 2030 GDP (%)	
Greece	11600	4.9	14600	6.2	31.6	29210	12.4	37740	16.0	37.3	40810	17.3	52340	22.2	35.7
Hungary	5220	3.0	6570	3.8	21.4	11811	6.8	11821	6.8	22.8	17031	9.8	18391	10.6	22.4
India	80600	1.2	367000	5.5	7.4	155287	2.3	204400	3.1	9.8	235887	3.6	571400	8.6	9.0
Indonesia	44000	2.3	142000	7.5	11.3	30714	1.6	95640	5.0	11.1	74714	3.9	237640	12.5	11.2
Ireland	11900	2.7	13300	3.0	13.7	72000	16.1	83500	18.6	16.3	83900	18.7	96800	21.6	15.9
Italy	91200	4.4	105000	5.0	22.6	248800	11.9	317600	15.2	28.7	340000	16.3	422600	20.2	27.0
Japan	229000	4.7	257000	5.3	8.0	601400	12.4	949000	19.5	11.0	830400	17.1	1206000	24.8	10.1
Korea, Republic of	82800	3.9	95300	4.5	12.6	151500	7.1	165700	7.8	15.5	234300	11.0	261000	12.3	14.5
Latvia	1510	3.5	1570	3.7	26.1	2020	4.7	2456	5.7	27.5	3530	8.3	4026	9.4	26.9
Lithuania	1960	3.0	2410	3.7	6.0	3285	5.0	3822	5.9	6.6	5245	8.1	6232	9.6	6.4
Luxembourg	2740	2.9	3160	3.4	16.2	–	0.0	–	0.0	0.0	2740	2.9	3160	3.4	16.2
Malta	677	3.9	806	4.6	21.3	1211	6.9	1422	8.1	22.3	1888	10.8	2228	12.7	21.9
Mexico	66400	4.0	96400	5.7	12.9	144900	8.6	146900	8.7	14.0	211300	12.6	243300	14.5	13.7
Netherlands	41300	4.1	53200	5.3	39.3	175100	17.4	194800	19.3	39.6	216400	21.5	248000	24.6	39.5
Peru	9910	3.0	13700	4.2	13.7	15797	4.8	23370	7.1	15.4	25707	7.8	37070	11.3	14.7
Philippines	41900	5.3	82500	10.5	11.4	68733	8.8	71150	9.1	12.3	110633	14.1	153650	19.6	12.0
Poland	25300	3.5	29500	4.1	18.7	32340	4.5	51800	7.2	21.2	57640	8.0	81300	11.3	20.1

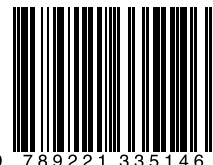
	Education SQ		Education HR		Fiscal returns as share of expenditures (%) in both scenarios	Health and social work SQ		Health and social work HR		Fiscal returns as share of expenditures (%) in both scenarios	Total SQ		Total HR		Fiscal returns as share of expenditures (%) in both scenarios
	Cost (required expenditures in million US\$, 2015 prices)	Cost as share of 2030 GDP (%)	Cost (required expenditures in million US\$, 2015 prices)	Cost as share of 2030 GDP (%)		Cost (required expenditures in million US\$, 2015 prices)	Cost as share of 2030 GDP (%)	Cost (required expenditures in million US\$, 2015 prices)	Cost as share of 2030 GDP (%)		Cost (required expenditures in million US\$, 2015 prices)	Cost as share of 2030 GDP (%)	Cost (required expenditures in million US\$, 2015 prices)	Cost as share of 2030 GDP (%)	
Portugal	9740	4.0	11000	4.5	23.6	24020	9.8	28580	11.6	29.7	33760	13.8	39580	16.1	27.9
Romania	4610	1.5	6360	2.1	20.9	11248	3.7	13800	4.5	23.4	15858	5.2	20160	6.6	22.7
Russian Federation	82900	4.9	108000	6.4	18.8	267300	15.9	274200	16.3	20.4	350200	20.8	382200	22.7	20.0
Slovakia	4360	3.0	5440	3.7	23.1	5790	4.0	5810	4.0	24.2	10150	7.0	11250	7.8	23.7
Slovenia	2640	4.5	3160	5.4	24.2	5493	9.4	5653	9.7	24.6	8133	13.9	8813	15.1	24.5
Spain	57700	3.6	68800	4.3	9.7	188600	11.8	213500	13.3	11.4	246300	15.4	282300	17.6	11.0
Sweden	44400	6.7	46200	6.9	22.8	111000	16.7	137800	20.7	20.8	155400	23.3	184000	27.6	21.4
Tunisia	3070	4.1	5370	7.1	18.1	7099	9.4	7616	10.1	21.0	10169	13.5	12986	17.2	20.1
Turkey	43800	3.0	61600	4.2	21.6	85286	5.8	99100	6.7	28.4	129086	8.8	160700	10.9	26.1
United Kingdom	170000	4.6	197000	5.4	24.5	391300	10.6	397000	10.8	32.2	561300	15.3	594000	16.2	29.9
United States	1110000	4.7	1520000	6.5	16.3	5398000	23.0	6320000	26.9	16.7	6508000	27.7	7840000	33.4	16.7
Vietnam	17400	3.6	45400	9.5	11.6	36838	7.7	44310	9.3	10.4	54238	11.4	89710	18.8	10.8
Total	3449382	3.4	4711750	4.69	15.8	11491627	11.4	13690094	13.6	17.9	14941009	14.9	18401844	18.3	17.4



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