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Labour market projections and time allocation in Myanmar

Application of a new computable general equilibrium (CGE) model

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Abstract: Myanmar has, in recent years, strengthened its focus on human capital as a development pillar, and introduced legislation and adopted conventions on child labour. But child exploitation continues, including use of forced labour by the military and children performing hazardous work. Moreover, Myanmar faces a rapidly closing window of opportunity within which to train its workforce to meet the future challenges of declining population growth and an ageing society. To address the twin challenges of child exploitation and future labour market needs, we study a comprehensive stylized education reform package for child workers aged 10–14. We employ a newly developed dynamically recursive 2021–40 computable general equilibrium model for Myanmar to analyse the economic and household income distribution impacts of a combined child work elimination and education programme allowing current child workers to achieve the same distribution of educational attainment as wider society over a 15-year transition period. While child work elimination would be costly for disadvantaged rural households, the combined programme may leave them better off, though only after a long transition period. At the societal level, the opportunity costs of child work elimination outweigh the long-term economic benefits of education over our 20-year horizon. In spite of the lack of societal economic benefits, our proposed reforms do seem to be advantageous, dealing with the unethical and appalling continuation of child labour practices while improving income distribution in favour of disadvantaged rural households. This would allow Myanmar to move towards the goal of SDG8, 'Decent Work and (Inclusive) Economic Growth', while training current generations to support an ageing Myanmarese society.

Key words: Myanmar, child labour, education reform, decent work, household income distribution

JEL classification: C68, I25, J22, O2

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1 Introduction

In order to raise awareness, the United Nations has declared 2021 the International Year for the Elimination of Child Labour. Similarly to other global indicators of health and welfare which have improved over recent years, including impressive reductions in global poverty rates, the most recent global International Labour Organization (ILO) estimates and trends indicate that the global prevalence of child labour declined from 10.6 per cent to 9.6 per cent between 2012 and 2016 (ILO 2017b, c).[1] Nonetheless, the estimates also suggest that 152 million children continued to be employed as child labour in 2016 (ILO 2017b, c). Recent estimates from the 2015 Myanmar Labour Force Survey (LFS) suggest that 9.3 per cent of Myanmarese children aged 5–17 (1,125,661 children) were engaged in child labour in 2015 (MOLES 2016a, b). In spite of the declining trends, the continuing high prevalence rates, as well as ILO's ongoing Descent Work Agenda, with its core focus on child labour (ILO 2021b), and the aligned focus of the Sustainable Development Goals (SDGs) on 'Decent Work and (Inclusive) Economic Growth' (SDG 8), suggests that child labour will remain a key policy issue over the coming decade, both at the global level and specifically for Myanmar.

In 2006, Myanmar adopted the *Myanmar National Plan of Action for Children 2006–2015* (NCRC 2006), but, in spite of being comprehensive and covering the health and education of children, the plan did not mention the issue of child labour, and discussion of child exploitation was limited to noting that 'although child abuse and child exploitation cases are very few in number, the issue still needs to be given attention' (NCRC 2006). More recently, more attention has been given to protecting children against exploitation, including legislation and the adoption of conventions on child labour. Hence, in 2013, ILO Convention 182 was ratified, including prohibition of the worst forms of child labour, and in 2016 the minimum working age was raised to 14 and the minimum age for dangerous work to 18 (DOL 2016). After continued criticism of violations of ILO conventions, including allegations of the continued use of forced labour by the military and of children performing hazardous work, e.g. in the important garment industry (DOL various years), the Myanmar government's Technical Working Group on Child Labour finalized a list of hazardous work prohibited for children under 18 (DOL 2017) and, more recently, ratified the ILO Minimum Age Convention 138 in June 2020 (ILO 2020). Implementation of the National Action Plan on Child Labour (ILO 2017a) has also been ongoing since 2017 (DOL 2017), but the US Department of Labor (DOL) has nonetheless continually reported 'no advancement' in its child labour and forced labour reports due to continuing reports of Myanmar's military using forced labour (DOL various years).

In spite of the lingering child labour and child exploitation issues, Myanmar has, over recent years, strengthened its focus on human capital as a development pillar. Hence, among the top priorities of the *Myanmar Sustainable Development Plan 2018–2030* (MPF 2018) are to foster human capital development (policy 3) and to promote holistic development of the agriculture, livestock, and industrial sectors to achieve development, food security, and increased exports (policy 6). In this paper, we aim to (1) focus on the construction of a demographic model and on linking it with our macroeconomic computable general equilibrium (CGE) model; and (2) use this comprehensive model framework to analyse how Myanmar households' time allocation for their young and adolescent school-age members, including school attendance and child work in agriculture and beyond, affects economic outcomes, schooling attainment, and the emergence of new skilled

[1] ILO and UNICEF have announced that they will release new global estimates and trends for child labour covering 2016–20 on 12 June 2021 (World Day against Child Labour) (ILO 2021a).

generations for the future labour market (objective 3), and how this affects future household welfare across Myanmar households (objective 2). In particular, we aim to analyse how a comprehensive strategy to implement labour market policy, including eliminating child work and complementary education programmes targeted at former child workers, may help to provide a future skilled workforce which can help the country to attain stated development goals and assist in meeting the future challenges of an ageing Myanmarese society. Due to the currently balanced demographic structure and the future prospect of an ageing population, Myanmar is facing a rapidly closing window of opportunity within which the workforce needs to be educated and trained in order to meet the future challenges of an ageing society. Moreover, due to the labour market mismatch, which particularly characterizes technical education and vocational training (TVET) in Myanmar (DTDA 2019), the focus should also be on educational reform.

The current generations of children (0–14yrs) and adolescents (15–17yrs) are key resources to support the future Myanmar labour market. Since potentially harmful child labour practices are widespread in Myanmar, accounting for 1,125,661 children aged 5–17 and including 546,119 in the 10–14 age group (MOLIP 2017a), just below the ILO minimum working age of 15, there is potential for Myanmar to reduce these harmful practices and, at the same time, to educate this child population strata, to the benefit of the children and their typically deprived families, but also to the future benefit of broader Myanmarese society. In fact, due to the projected declines in Myanmar population growth rates until 2050 (MOLIP 2017b), Myanmar cannot afford to miss this window of opportunity to, at the same time, eliminate child labour and improve the human capital of their future workforce.

Labour-focused strategies for equitable Myanmar growth have, in one previous study, been analysed using macroeconomic simulations models (Ko et al. 2016), but no studies have so far analysed the potential for education programmes, targeted at former child workers, to achieve the twin SDG goals of elimination of child labour before 2025 (SDG target 8.7) and equitable and inclusive economic growth (SDG 8).[2] In this paper, we want to fill this gap in the literature by analysing a set of policy scenarios to detail the transitional and long-run impacts of combining child work elimination and former child worker education strategy, with a focus on the group of child workers aged 10–14. Specifically, we will analyse the relative GDP costs of eliminating child work in this group, and of reducing the 'no education' labour force segment by the number of former child workers who are assumed to attain primary education, and we will contrast these costs with the potential GDP benefits from increased educational attainment and expansion of the primary, secondary, and tertiary education labour force segments, and the potential spillovers on incomes among the disadvantaged bottom-quintile households where child workers typically reside.

[2] The SDG 8 goal states that countries should 'promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all', while target 8.7 states that countries should 'take immediate and effective measures to eradicate forced labour, end modern slavery and human trafficking and secure the prohibition and elimination of the worst forms of child labour, including recruitment and use of child soldiers, and by 2025 end child labour in all its forms'.

2 Background

The demographic structure of the Myanmar population is, according to the 2014 Population and Housing Census, fairly balanced, with a population share of working-age Myanmarese (15–64) of 65.6 per cent (MIP 2015), reflecting that Myanmar has almost finished its demographic transition. Hence, the current population growth rate of 0.9 per cent per annum (2019) is projected to decline to 0.2 per cent per annum by 2050 (MOLIP 2017b). At the same time, according to the 2015 LFS, 30.9 per cent of the working-age population are illiterate or have received schooling below primary level, 34.1 per cent have attained primary school degree (5 years of schooling), 21.4 per cent have attained middle school degree (9 years of schooling), 6.5 per cent have attained high school (11 years of schooling), and 7.1 per cent have attained a tertiary degree, including vocational training (MOLES 2016a).[3] Due to the currently balanced demographic structure and the future prospect of an ageing population, Myanmar is therefore facing a rapidly closing window of opportunity within which the workforce needs to be educated and trained in order to meet the future challenges of an ageing society.

Reports of a labour market mismatch especially in TVET, with around 90 per cent TVET students being high-school students and enrolled at technical universities (DTDA 2019), indicates that TVET education reform will be a priority in the short to medium term, for example in order to respond to opportunities arising from the opening up of the economy and the potential to adopt technologies from abroad. At the same time, in spite of recent moderate increases in primary and secondary enrolment rates (World Bank 2021), the continuing low levels of educational attainment suggests that a broader strengthening of the education system is both possible and should be a priority. The challenges of the current education system have been set-out in Myanmar's *National Education Strategic Plan 2016–21* (MOE 2016), which covers nine areas with a focus on access, quality, and equity issues pertaining to most levels of education. Apart from improved education and skills acquisition for the labour force, other proposed labour market reform issues include weak enforcement and limited awareness of labour laws, in particular among local civil servants, and the need for expansion of social security coverage (Myo 2015).

Myanmar does not currently have an overall framework for coordinating and implementing labour market policies to promote employment. Instead, labour market policies are pursued in a decentralized fashion, by ministries such as the Ministry of Agriculture, Forestry and Irrigation (MOALI). As an example of the decentralized nature of labour market policies, the latter ministry, which was created in 2016, is responsible for promotion of agricultural productivity and of rural employment and poverty reduction. Other ministries have relevant responsibilities, such as the Ministry of Industry, which is involved in production activities and by implication in labour market policies, through management of state-owned enterprises (SOEs).

Labour-market-related social partners include employers' organizations and workers' unions. While still in their infancy, workers' unions, which were banned until 2011, have been one of the main areas of development of civil society organization over recent years. However, while the main trade union, the Confederation of Trade Unions in Myanmar (CTUM), experienced a 50 per cent increase in membership during 2014–18, the trade union density in total employment is still very

[3] Interestingly, the 2014 Myanmar Population and Housing Census indicates that there is a female gender bias at both the top and the bottom of the educational ladder: (1) approximately 15.6 per cent of female Myanmarese (aged 5+) have never attended primary school vs 12.6 per cent among men; and (2) 10.4 per cent of female Myanmarese have obtained an undergraduate diploma, BA, or postgraduate degree or vocational training vs 9.2 per cent of men (aged 15+) (MIP 2015).

low, at 0.9 per cent (DTDA 2019). The relative weakness of Myanmar's trade unions is underlined by reports that trade unions were sidelined in early 2019 in the drafting of central reforms, something which may have been a setback for the nascent tripartite social dialogue (DTDA 2019). Furthermore, since 76 per cent of the workforce are informally employed (DTDA 2019), the introduction of a formal minimum wage in 2015 had little impact on wage-setting for the broader workforce.[4] Due to the low trade union density and limited application of minimum wages, we will model the Myanmarese labour market as being cleared by flexible wages.

Turning to child work, according to the 2014 Myanmar Population and Housing Census (MPHC), 1,661,519 of the surveyed 7,862,576 children in the 10–17 age group (21.1 per cent) were classified as being 'usually' employed in the 12 months before the Census (MOLIP 2017b). Furthermore, according to the 2015 LFS, 1,125,661 of the estimated 1,278,909 working children (88.0 per cent) were classified as child labour. In what follows, we will therefore consider the entire Myanmarese population of child workers as being child labour. According to the ILO definition, child labour refers to work that deprives children (any person under 18) of their childhood, their potential, and their dignity and that is harmful to their physical or mental development. Specifically, it refers to work that is mentally or morally dangerous and harmful to children, or that interferes with their schooling. Global estimates suggest that 32 per cent of children engaged in child labour in the 5–14 age range are completely deprived of school (ILO 2017c), while the 2014 MPHC indicated that at age 10, 82.4 per cent of children who were working no longer attended school or had never attended school; by 12, this proportion had risen to 90.6 per cent (MIP 2017b).

In spite of repeated US DOL reports of 'no advancement' on child labour and forced labour issues (DOL various years), the policy record of adopting ILO's Minimum Age Convention 138 and Convention 182 prohibiting the worst forms of child labour and initiating the national 2015 LFS Survey, implemented with ILO assistance and including a large questionnaire dedicated to child work, suggests that there has been serious interest in understanding and possibly dealing with the child labour problem in Myanmar. At the same time, it is clear that child labour has been a priority issue for the international community since 2011, exemplified by the ongoing 2013–21 My-PEC child labour initiative, led by ILO (ILO 2021c) and funded by the US DOL (DOL 2021).[5]

In this paper, we employ a new macroeconomic 2017 Social Accounting Matrix (SAM) dataset (van Seventer et al. 2020) to calibrate our CGE model. The new SAM dataset was derived from a newly constructed 2017 input-output (IO) table for Myanmar (CSO 2020). Due to the historical paucity of IO and SAM data for Myanmar, there have been few CGE model applications to analyse Myanmarese macroeconomic policy issues. While a group of multi-country studies, based on the global Global Trade Analysis Project (GTAP) model, has been applied to analyse the impact on Myanmar's macroeconomy of a variety of issues, including regional trade reform (Rahman and Amin 2009) and the roll-out of China's Belt and Road Initiative (Hahm and Raihan 2018; Rana and Ji 2020), there have been virtually no attempts to undertake single-country CGE analyses for Myanmar. One recent single-country study, based on the Orani-G CGE model framework, has attempted to analyse the implementation of a labour growth strategy focused on 'high-quality

[4] Myanmar has a consultative National Tripartite Committee, consisting of employers' and workers' organizations and government representatives, which meets biannually to review the country's minimum wage. A new round of negotiations started in January 2020. The minimum wage has been adjusted over time, e.g. it increased from 3,600 Kyat (MMK) per day in 2015 to MMK4,800/day in 2018, but reports suggest that (1) there might be a lack of enforcement and (2) factories with enforcement may have seen reductions in other worker benefits (DTDA 2019).

[5] The My-PEC initiative involves promotion of legal reforms and technical support for data collection and data management, including support for the establishment of a child labour monitoring system and referral mechanism, and training of the labour inspectorate on child labour (DOL 2021).

education' (Ko et al. 2016). However, similarly to the global GTAP model studies, the single-country Orani-G model was calibrated on the basis of a Myanmar SAM dataset from the global GTAP database—a dataset which was constructed on the basis of a 1996 Vietnam IO table and subsequently included in the GTAP7 database, published in 2008 (Roland-Holst and Lar 2008).

The new 2017 SAM dataset has, to our knowledge, not yet been used to calibrate a flexible-price CGE model for Myanmar. However, it has been used to construct a multiplier model, also known as a fixed-price general equilibrium model, and applied to produce an *ex ante* analysis of the potential impacts of the COVID-19 pandemic on Myanmar's economy (Diao et al. 2020). The findings suggested that the two-working-week national lockdown, effectuated on 6 April 2020, on the eve of the Thingyan water festival seven-day holiday, and lasting until 27 April, together with other COVID-related global shocks, would reduce national GDP by 41 per cent over the lockdown period, and that non-farm employment would be significantly reduced over the two simulated April–June 2020 and July–September 2020 quarters.[6] Overall, while the multiplier model's simulated economic repercussions for Myanmar of the COVID-19 epidemic and response, based on a highly stylized set of global shocks and non-pharmaceutical interventions to maintain epidemic control during April–September 2020, may have exaggerated actual outcomes, the analyses of Diao et al. (2020) did produce a rapid-response analysis at a time of great uncertainty about the future pathway of the national epidemic and highlight a number of valid health- and intervention-focused macroeconomic pathways of COVID-19 transmission. Nonetheless, their work also highlights the importance of applying not only appropriate data but also appropriate economic model frameworks suited to the types of (in this case, dynamic and supply-side focused) scenarios being analysed.

In contrast to the relatively simple multiplier study, Ko et al.'s single-country CGE study applied the sophisticated Orani-G CGE model framework to study the possibility of a Myanmarese labour growth strategy focused on 'high-quality education' to achieve long-term 'growth with equity' (Ko et al. 2016). While some may object to the authors applying a static model to analyse a growth-focused scenario, the idea of simulating an 5 per cent expansion in effective skilled labour supply, based on 'education system improvement', as a means of stimulating GDP, both via increased skilled labour supplies and also as a means of stimulating demand for complementary unskilled labour employment in the context of excess unskilled labour supplies, is an interesting one. However, excess labour may not be as plentiful as indicated by Ko et al. (2016). While Myanmar has very low formal unemployment rates, amounting to 0.8 per cent in 2018, underemployment, defined as working less than 44 hours per week, reportedly affected 38 per cent of the workforce in 2010 (DTDA 2019). Nonetheless, the rate of labour underutilization was 'only' 6.9 per cent in 2015 (DTDA 2019), indicating that while there may be a mismatch of employment, e.g. due to seasonality of work (with low returns), the Myanmarese economy does not seem to have a large excess supply of labour. For the same reason, we will not entertain this assumption in our modelling.

While endogenous growth theory may hypothesize about educational and skill upgrading being the result of internal private education growth processes, and public education initiatives being a hindrance to growth except in situations with high externalities (Aghion and Howitt 1998; Zhang

[6] The large multiplier model impacts were derived from a wide range of stylized global and domestic shocks based on stylized assumptions about shock sizes and the dynamic phasing out of restrictions. Furthermore, the fact that multiplier models have no time dimension but rather involve an infinite number of iterations of intermediate-demand feedback relationships further complicates Diao et al.'s (2020) 'quarterly' interpretation of their 'quarterly' scenarios. The underlying assumption of the multiplier model, namely that the economy is demand-constrained, also makes it difficult to interpret the results of scenarios focused on supply-side lockdowns.

1996), market failures in education may well create such externalities, especially in the Myanmar context, and ethical and distributional considerations may also warrant policy intervention. The case for policy intervention may also be supported by Keynesian-inspired growth theories highlighting the potential importance of history dependence for economic growth outcomes (Dutt 2009). While child labour may have developed for a range of reasons, including as a substitute for missing social protection schemes (Nishino and Koehler 2011), the continuation of this practice, apart from being ethically unsound, may persist for longer than would otherwise have been needed in order to achieve its original goal, i.e. income support for disadvantaged families at risk—and the transformation of the disadvantaged households at the bottom income quintiles, which have the highest fertility rates and are the main suppliers of child labour, may be further postponed unless educational initiatives are targeted at these households. Hence, it has been proposed that 'some forms of education-related social transfers, such as scholarships to poor students' families for their successful transition from primary to secondary school, might be an acceptable as well as effective approach for Myanmar' (Nishino and Koehler 2011).

3 Methods

We utilize a twin set of demographic and macroeconomic models to analyse the labour market economic outcomes associated with our 'child work elimination and education strategy' focused on eliminating child work in 2022 (before 2025) and expanding former child workers' educational attainment. Specifically, we simulate (1) a counterfactual 2021–40 growth path and (2) seven policy scenarios related to child worker elimination and education in Myanmar during 2021–40. We disaggregate the demographic model to encompass projections for each of our 20 rural/urban farm/non-farm income quintile household types and use these household-specific projections to produce a full set of household-specific labour factor ownership projections for each of our four labour categories: uneducated labour and primary-, secondary-, and tertiary-educated labour.

Our dynamically recursive macroeconomic model for Myanmar is specified around a core static macroeconomic CGE model framework (Löfgren et al. 2002). This so-called multi-sector model framework allows a range of production activities and retail commodities to be captured. It is a standard neoclassical framework in which producers maximize the profits of their production decisions, consumers maximize the utility of their demand decisions, the government collects taxes to fund its spending, savings are collected and channelled into productive investment projects, and domestic retailers engage with foreign traders to trade in import and export goods. In the current context, this model framework, with its wage-clearing labour market specification, and combined with flexible allowance for multiple labour factor types, is ideal for detailed modelling of our child work and educational-attainment-related labour market policies.

We calibrated our static CGE model based on the recently established 2017 Myanmar SAM (van Seventer et al. 2020). This calibration allowed us to specify our CGE model with 43 activities and 43 commodities; eight production factors including land, natural resource livestock, natural resource fish stock, and physical capital stock; four labour factor types, and 20 household types (van Seventer et al. 2020) Furthermore, in order to model the child work elimination and education strategy over time, we turned the static model into a recursively dynamic model by adding labour and capital factor updating equations.

The labour factor updating equations were calibrated on the basis of a set of household-specific demographic projections, derived from a standard demographic model specification (Jensen et al. 2019). The household-specific demographic models were calibrated to a set of rural-urban 2014–50 population projections for Myanmar (MOLIP 2017b) and based on Myanmar-specific

demographic parametric assumptions derived from the United Nations' World Population Prospects 2019 database (UN 2020). Sets of base year activity-specific labour demand and household-specific labour factor ownership matrices were derived from labour force data accompanying the underlying 2017 SAM dataset (van Seventer et al. 2020) and derived from the 2015 LFS (MOLES 2016b), and subsequent calibration and counterfactual simulation of our labour factor updating equations, over 2021–40, and complementary projections of labour factor ownership growth paths, were based on the aforementioned household-specific demographic projections, over the same period, corrected for age-specific labour force participation rates published by the Central Statistical Organization (CSO 2018), and complemented with an assumption that the relative shares of the different educational-attainment-focused labour factor categories remain fixed. The explicit modelling of household-specific labour factor ownership, including ownership of child labour, within the macroeconomic model was critical, as it allowed for the modelling of shocks to household-specific labour factor supplies, and for the derivation of household-specific distributional impacts.[7]

We also extracted time series of capital stocks and capital depreciation rates for Myanmar from the Penn World Tables database version 10.0 (Groningen Growth and Development Centre 2020) in order to calibrate our capital updating equation. Finally, we used historical Myanmar GDP growth rates from the World Bank's World Development Indicators database (World Bank 2021) to run our model forward from 2017 to the base year for our policy simulations, 2021. Specifically, we varied the total factor productivity of our production activities to target the real GDP growth path between 2017 and 2021, and thereby to establish 2021 as the base year for our future policy simulations. We subsequently used the same approach to calibrate a counterfactual 2021–40 growth path to historical 2011–19 real (6.6 per cent per annum) and nominal (12.2 per cent per annum) GDP growth rates (World Bank 2021) against which the child work elimination and education strategy scenarios will be assessed.

We simulate five basic scenarios 1–5 (Tables 1–5) consisting of five component parts of our child work elimination and education strategy, including two envisioned adverse consequences (scenarios 1–2) and three intended beneficial educational and labour-augmenting policy outcomes (scenarios 3–5):

- **'No child work' scenario 1:** Simulates a complete elimination of child work for age groups 10–14.
- **'Loss of uneducated labour due to increased education enrolment' scenario 2:** Simulates the loss of future uneducated labour supply among former child workers, due to the proposed education programme; specifically, we assume that all 10–14-year-old child workers, in the absence of the education programme, would have joined the uneducated labour force category at age 15, but also that the education programme will ensure that only a minor share of former child workers, matching the average 21.4 per cent Myanmarese uneducated adult labour force share (van Seventer et al. 2020), will not attain primary school degrees, and that this will result in a 78.6 per cent reduction in the uneducated labour force contribution of former child workers.
- **'Benefit of increased primary educational attainment' scenario 3:** Simulates an expansion of primary education labour force supplies due to primary educational attainment among former child workers within the proposed education programme; Specifically, we conservatively assume that child workers have no prior schooling and

[7] Child labour was modelled as 'uneducated' labour, with reduced productivity measured by average wage gaps been child and adult workers (MOLES 2016a).

therefore have to start in grade 0, and that 33.8 per cent of the former child workers, matching the average Myanmarese primary education adult labour force share (van Seventer et al. 2020), will therefore attain their primary education degree at the fifth reform year, i.e. 2026 (mirroring the standard five-year elementary school duration) and also join the primary education labour force category at that time.

- **'Benefit of increased secondary educational attainment' scenario 4:** Simulates an expansion of secondary education labour force supplies due to secondary educational attainment among former child workers within the proposed education programme; Specifically, we assume that 35.8 per cent of former child workers, matching the average Myanmarese secondary education adult labour force share (van Seventer et al. 2020), will attain their secondary education degree at the twelfth reform year 12, i.e. 2032 (mirroring the standard four-year middle school + two-year high-school duration) and also join the secondary education labour force category at that time.
- **'Benefit of increased tertiary educational attainment' scenario 5:** Simulates an expansion of tertiary education labour force supplies due to tertiary educational attainment among former child workers within the proposed education programme; specifically, we assume that 9.0 per cent of the former child workers, matching the average Myanmarese tertiary education adult labour force share (van Seventer et al. 2020), will attain their tertiary education degree at the 15th reform, i.e. 2035 (mirroring the standard three-year college duration) and join the tertiary education labour force category at that time.

Together, these five scenarios represent a decomposition of the main costs and benefits associated with a strategy to remove existing child workers aged 10–14 from the Myanmarese labour market, and to educate this young generation, which included 546,119 children in 2014 (MOLIP 2017a).

In addition to scenarios 1–5, we also simulate two combined scenarios, 6 and 7 (Table 1). While the combined strategy scenario 6 combines all five core scenarios 1–5, the education programme scenario 7 combines only scenarios 2–5, i.e. it excludes scenario 1, which simulates the costs of eliminating child work. The motivation for excluding the opportunity costs of child work from scenario 7 is that the scenario is meant to capture a pure education programme scenario, and the elimination of child work may also be considered an ethical imperative; and, in spite of posing a real cost to poor households and to Myanmarese society more widely, it may be argued by politicians and other stakeholders that policy makers should ignore the costs of eliminating child work itself, i.e. that scenario 1 shouldn't be counted towards cost–benefit analyses designed to inform policy planning. In essence, scenario 7 is meant to inform policy makers who may take an ethical stance and be willing to disregard the opportunity costs of eliminating child work about the more narrow cost–benefit trade-off of the child-worker-focused education programme of the broader policy strategy.

We assume the child work elimination and education strategy is implemented in 2021, and takes effect from 2022. It is important to note that we do not assume that the education component of the strategy is targeted at other children beyond the existing pool of child workers. If the proposed education programme were to continue and target future prospective child workers in disadvantaged households and in targeted youth strata, i.e. the 10–14 age group, the potential educational and economic benefits and complementary household income distributional benefits could be magnified. In order to understand the transitional and long-term consequences of the strategy, we also vary the timing of implementation of our scenarios in two ways: (1) transitional ('transition') implementation, whereby we model staggered educational attainment of former child workers, and (2) long-term ('no transition') implementation, whereby we assume that all adverse consequences (scenarios 1–2) and all beneficial educational attainment outcomes (scenarios 3–5), are achieved from the outset in 2022, thereby mirroring how the strategy is likely to affect the

Myanmar economy, in relative terms, over the long run (Table 1). Finally, we note that the transitional implementation of our scenarios is done in a staggered fashion over a 14-year period between 2022 and 2035 (Table 1). The staggered transitional implementation is made possible due to the availability of child work data for one-year age groups between ages 10 and 14 (MOLES 2016b), thereby allowing for the dynamic modelling of the timing of educational attainment for each of these one-year age groups of child workers.

Table 1: Scenario specifications and implementations

		Timing of labour force shocks taking effect	
		'Transition' implementation	'No transition' implementation
Scenario 1	Elimination of child worker employment	Period 2 (2022)	Period 2 (2022)
Scenario 2	Elimination of former child workers from uneducated labour force, through attaining at least primary education	Periods 3–7 (2023–27)	Period 2 (2022)
Scenario 3	Addition of former (and prospective) child workers to primary-educated labour force, through attaining primary education and not progressing further	Periods 3–7 (2023–27)	Period 2 (2022)
Scenario 4	Addition of former (and prospective) child workers to secondary-educated labour force, through attaining secondary education and not progressing further	Periods 5–10 (2026–30)	Period 2 (2022)
Scenario 5	Addition of former child workers to tertiary-educated labour force, through attaining tertiary education	Periods 11–15 (2031–35)	Period 2 (2022)
Scenario 6	Scenarios 1–5 (full economic impacts of child work elimination and education programme)	Periods 2–15 (2022–35)	Period 2 (2022)
Scenario 7	Scenarios 2–5 (full economic impact of education programme, but not including economic impacts of child work elimination)	Periods 3–15 (2022–35)	Period 2 (2022)

Source: authors' construction based on own specifications.

In terms of CGE model parameterization and macro-closure, household demand is governed by a set of linear expenditure systems (LES); production is specified as constant elasticity of substitution (CES) functions of aggregate intermediate input demands (disaggregate commodity input demands are determined by Leontief specifications) and aggregate factor input demands (disaggregate factor input demands are also determined by CES specifications) with standard elasticity values for the top-level production specifications (0.8) and the bottom-level factor input demand specifications (0.6); trade between domestic and foreign agents is specified as a function of relative prices (determined by the real exchange rate), based on Armington CES specifications on the import side and constant elasticity of transformation (CET) specifications on the export side. Standard trade elasticity values are applied on the import side (1.2) and on the export side (1.5).

Our macroeconomic model closure specifies the GDP deflator as price numeraire, i.e. it is kept fixed at the counterfactual growth path. Furthermore, both our counterfactual growth path and our policy scenarios are simulated with a standard neoclassical model closure involving (1) price clearing of all goods and factor markets, (2) real exchange rate clearing of the balance of payments, and (3) savings-driven investment clearing of the capital account. In addition, the counterfactual growth path is simulated with a balanced macro-closure, ensuring that the government

consumption share of domestic absorption is fixed along the counterfactual growth path, while the policy scenarios keep government consumption fixed at the counterfactual growth path.

We present our simulation results below, with a focus on (1) macroeconomic GDP impacts, including impacts on GDP components, and (2) distributional household impacts on labour factor ownership and household welfare, including household income and consumption impacts. We present cumulative net present value (NPV) economic impacts over 2021–40 (at 2017 prices), based on a 10 per cent depreciation rate equivalent to the average 10 per cent real interest rate that has characterized Myanmar for most of the last decade, during 2011–19 (World Bank 2021). We also present annual dynamic impacts for the combined strategy scenario 6. The time series results are presented in real value terms (2017 prices) but without discounting, i.e. without taking the time value of money into account.

4 Results

The macroeconomic results of our child work elimination and education simulations are presented in Tables 2 and 3. These tables include results for our transitional 'transition' scenarios (Table 2) and our long-term 'no transition' scenarios (Table 3). Comparing the results of scenarios 1–5, it is clear that the difference between the transition impacts (Table 2) and the long-term impacts (Table 3) are minor when it comes to scenarios 1–3, with shorter transition periods, but growing when it comes to the secondary and tertiary education scenarios 4 and 5, with longer transition periods.

Scenario 1, the first 'no child work' scenario, naturally has the same impact in the transition and no-transition settings, since it is assumed that a ban on child work is effectuated instantly (in 2022) and therefore doesn't involve any transition period. Our results suggest that elimination of child work, for the 10–14 age group, would result in a GDP cost of roughly 12.3 trillion kyat (MKK) or US$9.1 billion at the 2017 exchange rate of MKK1,360/USD (WB 2021), over our 20-year horizon (in what follows, we use the 2017 exchange rate to assess US$ impacts in 2017 prices). Accounting for the time value of money, it therefore looks as if eliminating child work (for the 10–14 age group) would cost the Myanmarese society roughly MKK600 billion or $450 million every year over the 20-year period.

Scenario 2, 'loss of uneducated labour due to increased education enrolment', also naturally has a similar transition and long-run impact due to the brief transition period. Hence, since we're assuming that without education, all of our 10–14 age group of child workers would have entered the 'uneducated' labour force at age 15, i.e. over a limited time span of 1–5 years, there is naturally little difference between the transition and long-run GDP losses, which amount to MKK15.5–16.8 trillion or US$11.4–12.3 billion over our 20-year time horizon. The loss is tempered by our assumption that a share of the former child workers, conforming to average Myanmarese uneducated adult labour force levels, will still drop out of school before attaining their primary education and will therefore join the uneducated labour market segment when they reach 15 (as they would have had they continued doing child work). Nonetheless, this leaves a large group of former child workers pursuing primary (or higher) education, and we estimate that the loss of this uneducated labour force will cost Myanmarese society around US$570–620 million per year over our 20-year horizon, amounting to a marginal GDP reduction of just under 1 per cent over the longer term (but, of course, also bringing benefits in terms of education for the former child workers).

Scenario 3, the 'benefit of increased primary educational attainment' scenario, has less-similar transition and long-run impacts due to the five-year transition period for former child workers to primary education attainment. Since the entire 10–14 age group of child workers is assumed to attain primary education in the fifth reform year, they will all have turned 15. Since a share of these former child workers, in line with average Myanmarese educational attainment patterns, are assumed not to go on to achieve higher levels of education, they will join the primary education labour force segment in the fifth reform year, i.e. 2026. The difference between the transition and long-run impacts of the primary education labour force increase ranges from MKK4.7 to MKK6.4 trillion or US$3.4 to $4.7 billion, or $170 to $240 million per year over our 20-year horizon, equivalent to a long-term 0.27–0.38 per cent increase in the time value of future real GDP.

In contrast to scenarios 1–3, scenario 4, the 'benefit of increased secondary educational attainment' scenario, has noticeably different transition and long-run impacts, including all component parts of real GDP (Tables 2 and 3). Since the remaining group of former child workers is assumed to attain secondary education in the eleventh reform year, they will all have turned 21. Furthermore, since a share of these former child workers, in line with average Myanmarese educational attainment patterns, are assumed not to go on to achieve tertiary education, they will join the secondary education labour force segment in the eleventh reform year, i.e. 2032. Due to the long 11-year transition period, the time value of transitional secondary educational benefits over our 20-year horizon (Table 2) is markedly reduced compared with our long-run scenario (Table 3). The results indicate that the GDP benefits of secondary education are reduced by almost two-thirds during the transition period, from MKK7.8 trillion to MKK2.7 trillion, or US$5.7 billion to $2.0 billion ($290 to $140 million per annum), indicating that the benefits of secondary education among former child workers will only be reached gradually.

The impact of a long and less beneficial transition period is further magnified when it comes to scenario 5, the 'benefit of increased tertiary educational attainment' scenario. Since the remaining group of former child workers is assumed to attain tertiary education in the 14th reform year, they will all have turned 24 and will therefore be ready to join the tertiary labour force segment in this year , i.e. 2035. Our results (Tables 2 and 3) clearly show that the GDP benefits of tertiary education attainment among former child workers will remain subdued for three-quarters of our 20-year transition period, and that the time value of benefits during our transition period will therefore be reduced by more than 90 per cent, from MKK3.3 trillion to MKK0.3 trillion, equivalent to US$2.4 billion to $0.2 billion ($120 to $11 million per annum).

In spite of a lack of return to tertiary education students during most of the long transition period, the dynamic scenario 6 impacts on household-specific incomes (Figure 2) clearly indicate the large distributional potential of a strategy of supporting higher educational attainment among disadvantaged bottom-income-quintile households. Hence, in spite of household incomes declining for almost all households until 2034 (due to student-induced effective labour supply losses), the tertiary educational attainment impact from 2035 onwards is an increase in income levels for virtually all rural households (except wealthier rural non-farm 4q and rural farm 5q households with little child labour), and a reduction in income levels for virtually all urban households (most of which also supply little child labour).[8] The negative impacts on most rural income levels during the 15-year transition period indicate that the proposed child labour elimination and education strategy will, most likely, need to be complemented by some kind of compensatory social security scheme, in order that the long prospective period of rural income

[8] The declining urban incomes result from a strong drop in the marginal product (i.e. wages) of tertiary education labour (due to increased tertiary education labour supplies from 2035 onwards).

losses does not lead the disadvantaged rural households (as the owners of the child labour in the first place) to reject the broad strategy outright from the outset.

Looking at the macroeconomic NPV impacts of the combined strategy scenario 6 (Tables 2 and 3), our results suggest that eliminating child work and initiating an education programme to educate the former child workers would be costly to Myanmarese society. Hence, there would be net costs associated with the broad strategy, both during the transition period (1.26 per cent of real GDP) and in the long run (0.78 per cent of real GDP), and subdued real investment especially during transition (1.25 per cent of real investment) but also in the long run (0.40 per cent of real investment) indicates that such a strategy may create a drag on the Myanmarese economy for a long time. Nonetheless, the final education programme, scenario 7, which includes scenarios 2–5 but excludes economic losses from eliminated child work, suggests that while the transition period, with a reduced uneducated labour force that is only subsequently made up for by an increased educated labour force, would be costly to Myanmar society (0.19 per cent of real GDP), the education programme by itself would result in a small (0.03 per cent of real GDP) benefit and, more importantly, a sizeable increase in real investment (0.52 per cent) and capital accumulation that would complement the increasingly educated Myanmarese workforce and lead to additional benefits beyond our 20-year time horizon. This result is remarkable, since we have not modelled potential excess uneducated and primary education labour supplies—something which would be likely to strongly increase the economic benefits of education, since it would increase the marginal return to less-skilled labour types and pull in additional labour resource from the excess labour pool. The fact that we find a marginal GDP benefit, although small, therefore suggests that our education programme is likely to be beneficial (beyond the admittedly costly elimination of child labour).

Comparing the long-term educational benefits across scenarios 3–5, it is striking that while the individuals attaining tertiary education, as well as their wider families, would be expected to benefit greatly, the society-level benefits of around US$120 million per year are limited due to the relatively small group attaining academic degrees, and significantly below the long-run society-wide benefits of increased primary educational attainment ($240 million per year) and secondary educational attainment ($290 million). These differences, presumably, are mostly the result of level effects (primary and secondary attainment numbers far outpacing additional tertiary attainment numbers), while price effects play less of a role. It should also be noticed that non-linearities seem to lead the combined strategy scenario 6 to have more adverse impacts compared with the sum of the individual scenarios 1–5. This suggests that the loss of uneducated and primary education labour supplies may reduce returns to more highly educated labour supplies to such an extent that it outweighs the beneficial impact of increased levels of secondary and tertiary education on the marginal product of less highly educated labour segments.

The distributional implications of our scenarios can be gauged from Figures 1 and 2, providing detailed dynamic income and consumption impacts of our combined strategy scenario 6 across our 20 rural and urban household types, and Tables 4 and 5 provide more detailed NPV household income results for all seven scenarios (see Appendix A2 for detailed household consumption impacts). The NPV results again highlight that our 'no child work' scenario 1 and 'loss of uneducated labour due to increased education enrolment' scenario 2 represent potentially significant costs. Hence, our transitional (Table 4) and long-run (Table 5) results indicate that NPV household income declines by MKK11.1 trillion in scenario 1 and MKK13.9–15.0 trillion in scenario 2, implying that the combined scenarios 1 and 2 are likely to reduce NPV household income by 1.6–1.7 per cent over our 20-year time horizon.

Our results also indicate that the tertiary education scenario 5, in spite of increasing long-run real value added generation (Table 3), also lowers long-run aggregate NPV real household income

generation by around 0.05 per cent (Table 5). This perhaps surprising result is driven almost exclusively by a strong 2.8–3.2 per cent drop in tertiary education labour wages over our 20-year horizon (not shown) which leads to a similarly strong 2.5 per cent overall long-run urban income drop, and a 3.2 per cent long-run income drop specifically among urban non-farm households in the highest income quintile 5q. All other urban households also experience declining income from tertiary educational attainment among former child workers, but the overall urban income decline of MKK15.2 trillion (a 2.5 per cent drop) contrasts with an almost equivalent rural income expansion of MKK14.4 trillion (a 1.5 per cent increase) (Table 5). While all rural households benefit, the strongest benefits are recorded among rural households in the two bottom income quintiles 1q and 2q (2.6–8.0 per cent expansions).

The scenario 5 results demonstrate the significant power of the child work elimination and education strategy to improve household income and welfare distributional outcomes, especially for the lowest (rural) income groups in Myanmar. But it also highlights a key weakness of the overall strategy—namely, that the distributional income improvements for the rural bottom-income-quintile households, amounting to 0.8–8.7 per cent in the combined strategy scenarios 6 and 7, rest for the most part on former 'child work' household members attaining tertiary education. This is confirmed by the non-linear transitional scenario 6 impacts on household income (Figure 2), where the long-term distributional benefits only stand to occur after 2035. In general, while the tertiary educational attainment scenario 5 increases rural 1q and 2q incomes by 2.6–8.0 per cent, the primary and secondary educational attainment scenarios 3–4 increase rural household 1q and 2q incomes by 'only' 0.1–1.1 per cent and 0.4–1.8 per cent respectively. And since the costly loss of child work and study-related losses of uneducated labour supplies reduce rural 1q and 2q household incomes by 0.5–1.6 per cent and 0.7–2.2 per cent respectively (scenarios 1 and 2), the favourable distributional outcomes may well be reduced, or disappear entirely, if the assumed share of former child workers attaining tertiary education does not materialize.

Table 2: Macroeconomic impacts of ‘transition’ child work elimination and education scenarios (MKK tr in 2017 prices)

	Base	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5		Scenario 6		Scenario 7	
		Δ value	% change	Δ value	% change	Δ value	% change	Δ value	% change	Δ value	% change	Δ value	% change	Δ value	% change
Real GDP (cumulative)*	1,706	−12.3	−0.72	−15.5	−0.91	4.7	0.27	2.7	0.16	0.3	0.02	−21.5	−1.26	−7.9	−0.46
Private consumption	973	−7.6	−0.78	−9.5	−0.98	2.7	0.27	1.3	0.13	−0.3	−0.03	−14.2	−1.46	−5.9	−0.60
Government consumption	221	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00
Investment	580	−4.7	−0.82	−6.0	−1.03	2.0	0.34	1.4	0.24	0.6	0.10	−7.2	−1.25	−2.0	−0.35
Exports	519	−3.3	−0.64	−4.1	−0.80	1.4	0.28	0.9	0.18	0.5	0.09	−4.9	−0.95	−1.3	−0.25
Imports	587	−3.3	−0.56	−4.1	−0.70	1.4	0.25	0.9	0.16	0.5	0.08	−4.9	−0.84	−1.3	−0.22
	Work years (m)	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change
Labour employment	487.28	−6.07	−1.25	−7.67	−1.57	2.77	0.57	1.76	0.36	0.30	0.06	−8.93	−1.83	−2.86	−0.59
Uneducated	103.05	−6.07	−5.89	−7.67	−7.45	0.00	0.00	0.00	0.00	0.00	0.00	−13.75	−13.34	−7.67	−7.45
Primary	163.04	0.00	0.00	0.00	0.00	2.77	1.70	0.00	0.00	0.00	0.00	2.77	1.70	2.77	1.70
Secondary	175.08	0.00	0.00	0.00	0.00	0.00	0.00	1.76	1.00	0.00	0.00	1.76	1.00	1.76	1.00
Tertiary	46.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.64	0.30	0.64	0.30	0.64

Notes: * 10% discount rate applied to derive cumulative 2021–40 real GDP components.

Source: authors’ construction based on own calculations.

Table 3: Long-term macroeconomic impacts of ‘no transition’ child work elimination and education scenarios (MKK tr in 2017 prices)

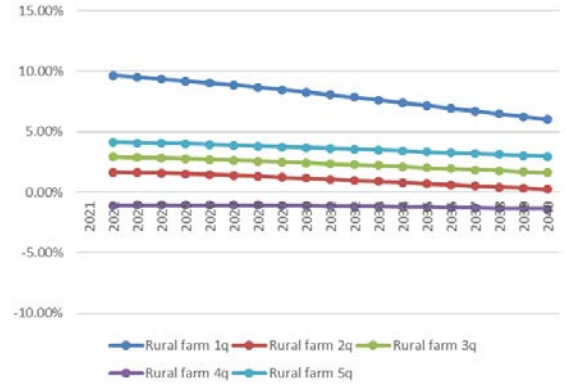
	Base	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5		Scenario 6		Scenario 7	
		Δ value	% change	Δ value	% change	Δ value	% change	Δ value	% change	Δ value	% change	Δ value	% change	Δ value	% change
Real GDP (cumulative and discounted)*	1,706	−12.3	−0.72	−16.8	−0.98	6.4	0.38	7.8	0.46	3.3	0.19	−13.3	−0.78	0.6	0.03
Private consumption	973	−7.6	−0.78	−10.3	−1.06	3.7	0.38	4.0	0.41	0.3	0.03	−11.0	−1.13	−2.4	−0.25
Government consumption	221	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00
Investment	580	−4.7	−0.82	−6.4	−1.11	2.7	0.47	3.8	0.66	3.0	0.51	−2.3	−0.40	3.0	0.52
Exports	519	−3.3	−0.64	−4.5	−0.87	2.0	0.38	2.8	0.53	2.7	0.51	−0.8	−0.16	2.9	0.56
Imports	587	−3.3	−0.56	−4.5	−0.77	2.0	0.34	2.8	0.47	2.7	0.45	−0.8	−0.14	2.9	0.49
	Work years (m)	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change
Labour employment	487.28	−6.07	−1.25	−8.15	−1.67	3.50	0.72	3.71	0.76	0.94	0.19	−6.07	−1.25	0.00	0.00
Uneducated	103.05	−6.07	−5.89	−8.15	−7.91	0.00	0.00	0.00	0.00	0.00	0.00	−14.22	−13.80	−8.15	−7.91
Primary	163.04	0.00	0.00	0.00	0.00	3.50	2.15	0.00	0.00	0.00	0.00	3.50	2.15	3.50	2.15
Secondary	175.08	0.00	0.00	0.00	0.00	0.00	0.00	3.71	2.12	0.00	0.00	3.71	2.12	3.71	2.12
Tertiary	46.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	2.03	0.94	2.03	0.94	2.03

Note: * 10% discount rate applied to derive cumulative 2021–40 real GDP components.

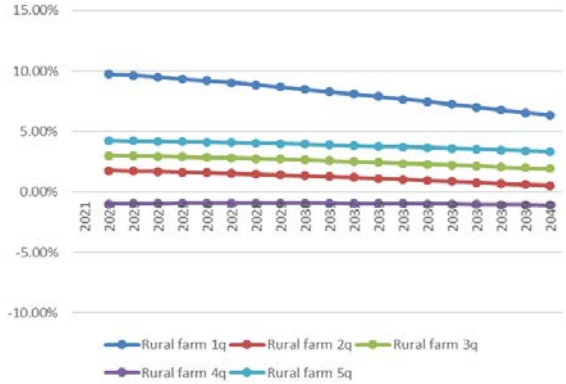
Source: authors’ construction based on own calculations.

Figure 1: Combined ‘no transition’ scenario 6—household annual growth impacts, 2021–40 (% per annum)

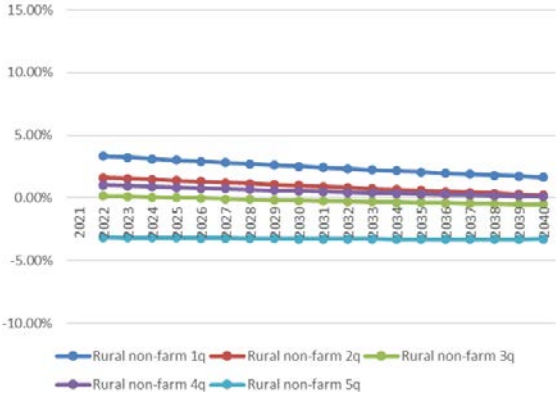
Rural farm income



Rural farm consumption



Rural non-farm income



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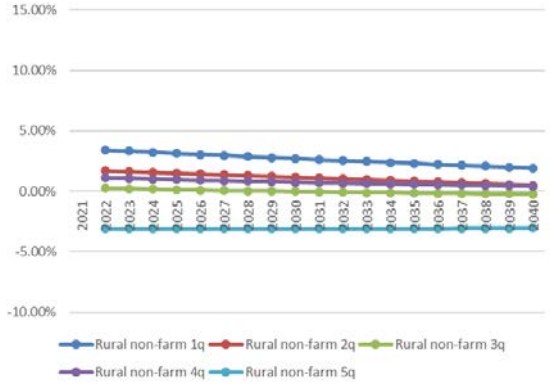
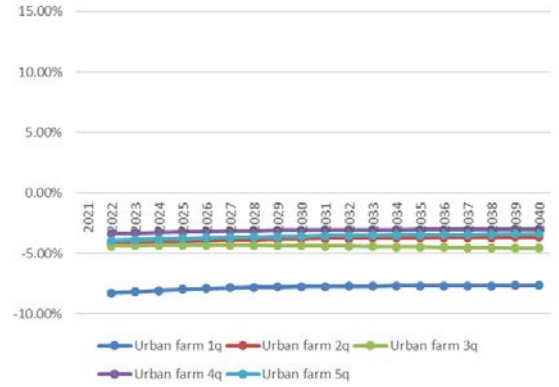


Urban farm income



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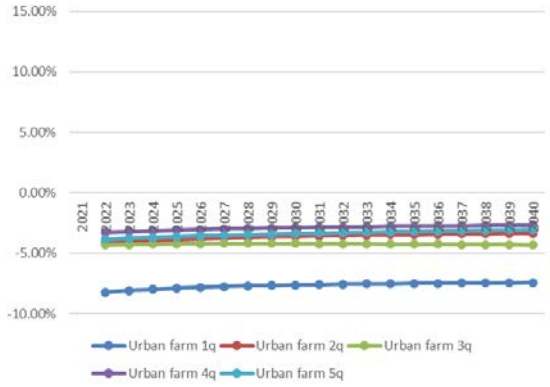

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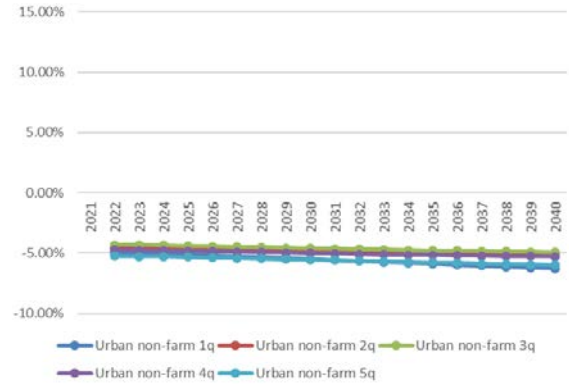

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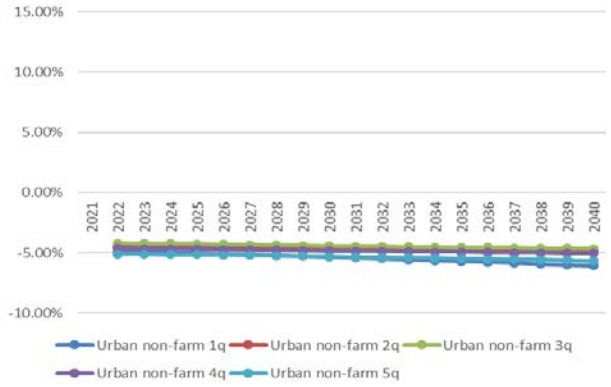
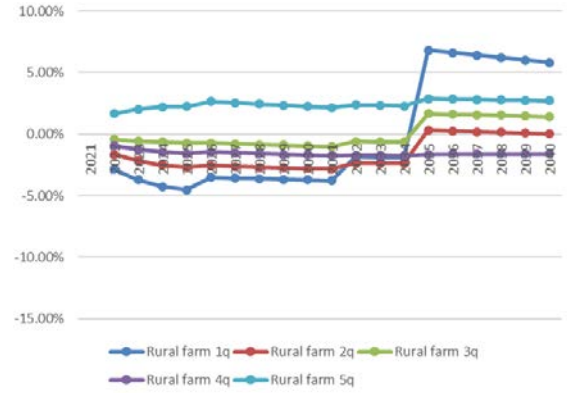


Source: authors’ illustration based on own calculations.

Figure 2: Combined ‘transition’ scenario 6—household annual growth impacts, 2021–40 (% per annum)

Rural farm income



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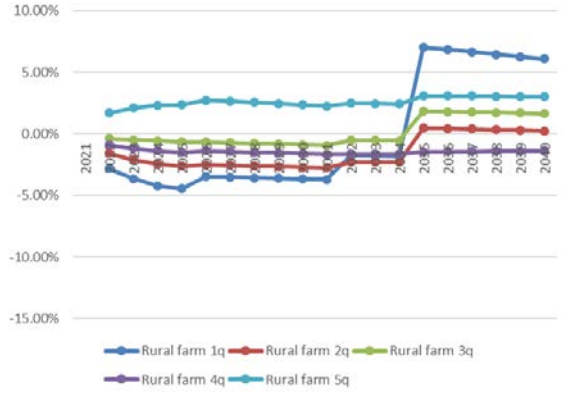
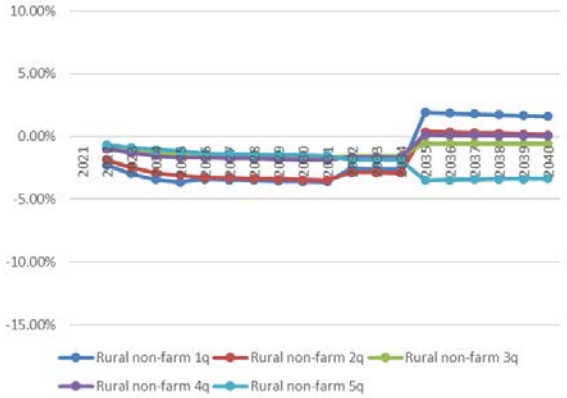
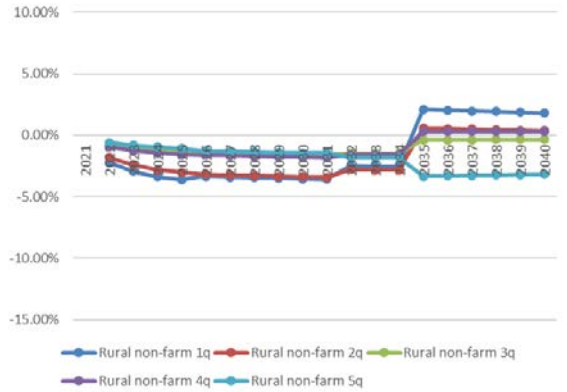


Rural non-farm income



Rural non-farm consumption



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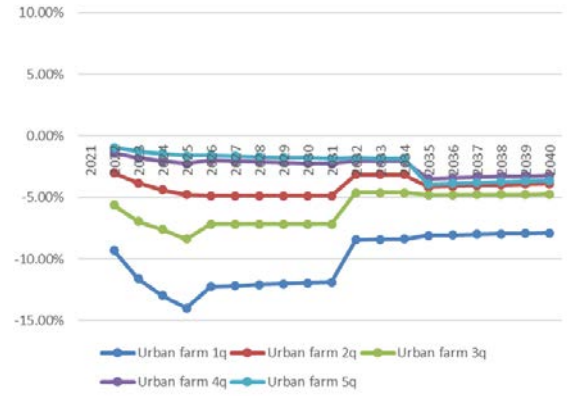

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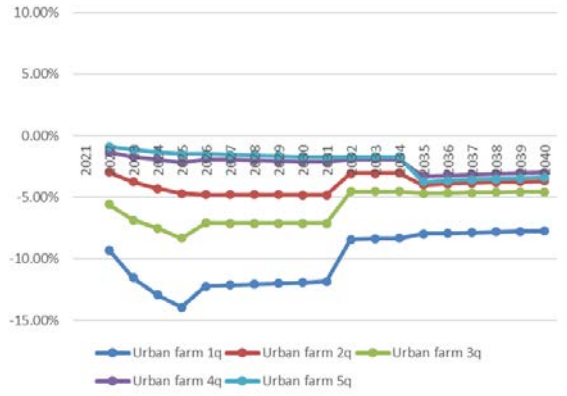
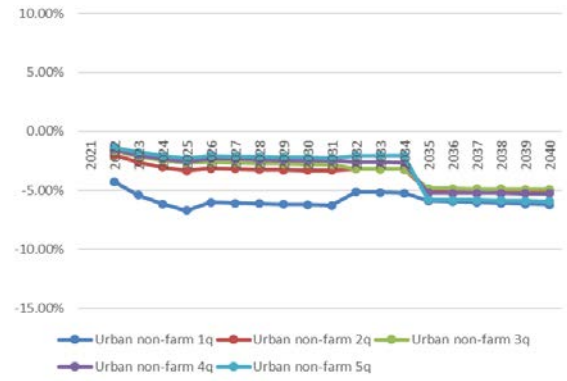
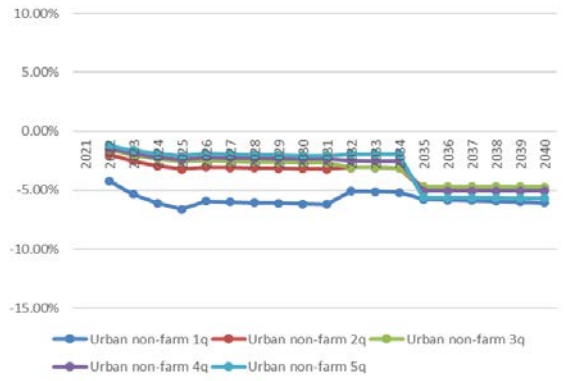


Urban non-farm income



Urban non-farm consumption



Source: authors’ illustration based on own calculations.

Table 4: Distributional household income impacts of ‘transition’ child work elimination and education scenarios, 2021–40 (MKK tr in 2017 prices)

	Base income	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5		Scenario 6		Scenario 7	
		Δ income	% change	Δ income	% change	Δ income	% change	Δ income	% change	Δ income	% change	Δ income	% change	Δ income	% change
All households (cumulative)*	1,558.9	−11.1	−0.71	−13.9	−0.89	3.8	0.25	1.6	0.11	−0.7	−0.04	−21.3	−1.37	−9.1	−0.58
Rural households (cumulative)*	952.7	−5.00	−0.52	−6.27	−0.66	2.00	0.21	1.34	0.14	3.07	0.32	−5.38	−0.56	0.07	0.01
Rural farm 1q	37.7	−0.60	−1.60	−0.77	−2.03	0.31	0.82	0.25	0.67	0.67	1.77	−0.27	−0.73	0.45	1.19
Rural farm 2q	77.1	−0.78	−1.01	−0.98	−1.27	0.20	0.26	0.16	0.20	0.43	0.56	−1.10	−1.43	−0.21	−0.27
Rural farm 3q	107.3	−0.41	−0.38	−0.51	−0.48	0.14	0.13	0.19	0.18	0.51	0.48	−0.12	−0.11	0.32	0.30
Rural farm 4q	147.4	−0.98	−0.66	−1.23	−0.83	0.36	0.24	0.10	0.07	0.05	0.03	−1.81	−1.23	−0.73	−0.50
Rural farm 5q	185.8	0.96	0.51	1.22	0.66	0.57	0.30	0.26	0.14	0.25	0.13	3.51	1.89	2.30	1.24
Rural non-farm 1q	56.7	−0.78	−1.37	−0.98	−1.73	0.20	0.35	0.21	0.37	0.52	0.92	−0.96	−1.69	−0.06	−0.11
Rural non-farm 2q	73.8	−0.86	−1.17	−1.08	−1.47	0.05	0.06	0.17	0.23	0.50	0.67	−1.36	−1.85	−0.38	−0.51
Rural non-farm 3q	75.4	−0.45	−0.59	−0.56	−0.74	0.09	0.12	0.03	0.03	0.16	0.21	−0.77	−1.02	−0.29	−0.38
Rural non-farm 4q	86.8	−0.58	−0.67	−0.73	−0.84	0.10	0.11	0.09	0.10	0.32	0.37	−0.87	−1.01	−0.23	−0.27
Rural non-farm 5q	104.7	−0.52	−0.50	−0.65	−0.62	−0.01	−0.01	−0.11	−0.11	−0.33	−0.32	−1.63	−1.56	−1.09	−1.05
Urban households (cumulative)*	606.3	−6.08	−1.00	−7.60	−1.25	1.84	0.30	0.30	0.05	−3.72	−0.61	−15.91	−2.62	−9.19	−1.52
Urban farm 1q	1.8	−0.08	−4.43	−0.10	−5.45	0.03	1.57	0.02	1.10	0.00	0.07	−0.15	−8.05	−0.05	−2.77
Urban farm 2q	3.0	−0.05	−1.63	−0.06	−1.99	0.01	0.29	0.02	0.60	−0.01	−0.19	−0.10	−3.22	−0.04	−1.31
Urban farm 3q	5.3	−0.15	−2.83	−0.18	−3.47	0.06	1.16	0.05	0.86	0.00	−0.03	−0.26	−4.89	−0.08	−1.52
Urban farm 4q	10.2	−0.09	−0.87	−0.11	−1.07	0.04	0.35	0.01	0.13	−0.03	−0.28	−0.19	−1.85	−0.09	−0.88
Urban farm 5q	29.5	−0.20	−0.66	−0.24	−0.82	0.05	0.19	0.02	0.08	−0.12	−0.41	−0.50	−1.70	−0.29	−0.97
Urban non-farm 1q	17.4	−0.44	−2.52	−0.54	−3.12	0.14	0.81	0.07	0.40	−0.02	−0.12	−0.87	−5.01	−0.36	−2.06
Urban non-farm 2q	37.3	−0.47	−1.26	−0.58	−1.55	0.12	0.32	0.02	0.06	−0.14	−0.38	−1.11	−2.98	−0.58	−1.56
Urban non-farm 3q	62.1	−0.63	−1.02	−0.79	−1.28	0.11	0.18	−0.08	−0.12	−0.21	−0.33	−1.66	−2.68	−0.96	−1.55
Urban non-farm 4q	94.8	−0.92	−0.97	−1.15	−1.21	0.27	0.28	−0.04	−0.04	−0.50	−0.53	−2.44	−2.57	−1.43	−1.50
Urban non-farm 5q	344.7	−3.05	−0.89	−3.83	−1.11	1.00	0.29	0.21	0.06	−2.69	−0.78	−8.64	−2.51	−5.31	−1.54

Note: * 10% discount rate (2017 prices).

Source: authors’ construction based on own calculations.

Table 5: Distributional household income impacts of ‘no transition’ child work elimination and education scenarios, 2021–40 (MKK tr in 2017 prices)

	Base Income	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5		Scenario 6		Scenario 7	
		Δ income	% change	Δ income	% change	Δ income	% change	Δ income	% change	Δ income	% change	Δ income	% change	Δ income	% change
All households (cumulative)*	1,558.9	−11.1	−0.71	−15.0	−0.97	5.3	0.34	5.2	0.33	−0.8	−0.05	−17.9	−1.15	−5.5	−0.36
Rural households (cumulative)*	952.7	−5.00	−0.52	−6.79	−0.71	2.79	0.29	3.99	0.42	14.36	1.51	8.53	0.90	14.19	1.49
Rural farm 1q	37.7	−0.60	−1.60	−0.83	−2.20	0.43	1.13	0.69	1.82	3.03	8.02	2.51	6.64	3.28	8.67
Rural farm 2q	77.1	−0.78	−1.01	−1.07	−1.38	0.28	0.36	0.45	0.58	1.98	2.56	0.68	0.88	1.61	2.08
Rural farm 3q	107.3	−0.41	−0.38	−0.55	−0.51	0.19	0.18	0.56	0.52	2.36	2.19	2.08	1.93	2.54	2.36
Rural farm 4q	147.4	−0.98	−0.66	−1.33	−0.90	0.49	0.34	0.31	0.21	0.28	0.19	−1.35	−0.92	−0.26	−0.17
Rural farm 5q	185.8	0.96	0.51	1.33	0.71	0.78	0.42	0.75	0.40	1.20	0.64	5.32	2.86	4.08	2.19
Rural non-farm 1q	56.7	−0.78	−1.37	−1.06	−1.87	0.27	0.48	0.59	1.04	2.40	4.22	1.23	2.17	2.17	3.82
Rural non-farm 2q	73.8	−0.86	−1.17	−1.18	−1.60	0.07	0.09	0.49	0.67	2.29	3.10	0.62	0.84	1.64	2.22
Rural non-farm 3q	75.4	−0.45	−0.59	−0.61	−0.80	0.13	0.18	0.11	0.14	0.75	0.99	−0.12	−0.15	0.38	0.50
Rural non-farm 4q	86.8	−0.58	−0.67	−0.79	−0.91	0.14	0.16	0.27	0.31	1.48	1.70	0.42	0.49	1.08	1.25
Rural non-farm 5q	104.7	−0.52	−0.50	−0.71	−0.67	0.00	0.00	−0.23	−0.22	−1.41	−1.34	−2.86	−2.73	−2.33	−2.23
Urban households (cumulative)*	606.3	−6.08	−1.00	−8.25	−1.36	2.53	0.42	1.17	0.19	−15.17	−2.50	−26.44	−4.36	−19.73	−3.25
Urban farm 1q	1.8	−0.08	−4.43	−0.11	−6.03	0.04	2.15	0.05	2.95	0.01	0.38	−0.11	−6.08	−0.01	−0.64
Urban farm 2q	3.0	−0.05	−1.63	−0.07	−2.21	0.01	0.40	0.05	1.62	−0.02	−0.78	−0.09	−2.96	−0.03	−1.01
Urban farm 3q	5.3	−0.15	−2.83	−0.20	−3.84	0.08	1.59	0.12	2.31	0.00	−0.04	−0.18	−3.51	0.00	−0.05
Urban farm 4q	10.2	−0.09	−0.87	−0.12	−1.18	0.05	0.48	0.04	0.39	−0.12	−1.14	−0.25	−2.43	−0.15	−1.45
Urban farm 5q	29.5	−0.20	−0.66	−0.26	−0.90	0.08	0.26	0.07	0.25	−0.50	−1.70	−0.83	−2.81	−0.61	−2.08
Urban non-farm 1q	17.4	−0.44	−2.52	−0.60	−3.44	0.20	1.12	0.19	1.11	−0.08	−0.45	−0.82	−4.72	−0.30	−1.71
Urban non-farm 2q	37.3	−0.47	−1.26	−0.64	−1.71	0.17	0.45	0.08	0.22	−0.58	−1.55	−1.50	−4.04	−0.97	−2.60
Urban non-farm 3q	62.1	−0.63	−1.02	−0.86	−1.39	0.16	0.26	−0.16	−0.25	−0.85	−1.36	−2.40	−3.88	−1.70	−2.75
Urban non-farm 4q	94.8	−0.92	−0.97	−1.25	−1.32	0.37	0.39	−0.04	−0.04	−2.09	−2.21	−4.02	−4.24	−3.01	−3.17
Urban non-farm 5q	344.7	−3.05	−0.89	−4.15	−1.20	1.37	0.40	0.75	0.22	−10.94	−3.18	−16.24	−4.72	−12.94	−3.76

Note: * 10% discount rate (2017 prices).

Source: authors’ construction based on own calculations.

5 Conclusion and discussion

In this paper, we focused on child work among the 10–14 age group in Myanmar, and we showed that child work elimination (almost equivalent to complete child labour elimination in Myanmar) would be a costly policy option, especially for the disadvantaged rural households who own most of the child work supplies. However, we also demonstrated that combining child work elimination and child worker education programmes into one strategy may leave these rural households better off. Nonetheless, while our long-term simulations confirmed that the disadvantaged rural households would be better off after the transition period, our transitional simulations highlighted that the income improvement would only occur after a very long period of reduced income levels. This suggests that the proposed child work elimination and education strategy would, most likely, need to be complemented by some kind of compensatory social security scheme, in order for the disadvantaged rural households (as owners of the child labour) to voluntarily accept joining the programme, and to thereby achieve the twin goals of eliminating the child labour before 2025 (SDG Target 8.7) and improving income distribution.

However, our simulations also demonstrated that while the education programme by itself had a small long-term GDP benefit (which could grow larger beyond our time horizon due to simultaneous expansion of investment and capital accumulation, which could raise marginal returns to the programme-induced expansion of highly educated workers), the simulated time value of transitional GDP costs far outweighed the simulated time value of the long-term GDP benefits. This indicates that our strategy as it stands would be unlikely to achieve the additional SDG 8 goal of inclusive growth (the strategy would be inclusive but unlikely to bring additional growth). The lack of additional growth can be traced to the student-induced labour supply losses, which over the student study period would be exacerbated by the opportunity cost stretching over an extended child and young adult age range of 10–23, thereby exceeding the lifetime productivity gains of the subsequent supply of more highly educated labour (at least exceeding the long-term gains which we measured over our 20-year time horizon). But in spite of the lack of growth, we believe that our simulations do illustrate a possible way to approach the twin problems of dealing with the unethical and appalling continuation of child labour practices and, at the same time, seizing the window of opportunity to properly educate current generations in order to support Myanmar during its future transition to an ageing society.

A number of caveats are also in order. First, the scenarios were highly stylized. In particular, it was conservatively assumed that all child workers aged 10–14 had no prior education and therefore would have to start over from kindergarten. This extreme assumption will obviously have increased the net costs of the strategy, as it will have magnified the opportunity costs of studying and attaining degrees. On the other hand, our assumption that the group of former child workers, even if supported by a formalized education programme, would be able to attain various educational levels and degrees to the same extent as the average population is likely to be a liberal assumption, and the same goes for the assumption that all student progression would occur without delays. But while our scenarios are highly stylized, we do believe they capture some salient features which are worth exploring further. In particular, the current limitations on child workers' ability to study are not only a matter of not having the time; Myanmarese child workers are also predominantly of minority origin, implying that they might face difficulties following school classes even if they were not working, since it is mandatory to teach in Myanmarese. Furthermore, while primary education is in principle mandatory, the regulations are typically not enforced, and for this and other reasons, children from disadvantaged households typically have a hard time keeping up. Together with the need for costing of the education programme, and the likely need for complementary social security programmes complementary to the it and targeted at the

disadvantaged families of the working children, these caveats further complicate the implementation of the proposed child work elimination and education strategy. Nonetheless, we believe that the benefits in terms of achieving important development targets and improving distributional outcomes, improving workforce skills to take advantage of opportunities arising from the opening up of the economy, and supporting the future ageing Myanmarese society merit the extra effort and make the current strategy an indispensable component of a broader strategy. This could also include, for example, additional measures to reduce labour market mismatches and further stimulate capital accumulation, such as via increased foreign direct investment inflows, and thereby further increase the returns to education among current child workers, from both the personal and the society perspective.

One final caveat: we have not attempted to make any contingencies in our analyses for the effects in Myanmar of the Covid-19 pandemic. Since we are analysing policy issues over a 20-year time horizon, and due to the general uncertainty about the effects of the virus in Myanmar (and of other epidemics, for that matter), we decided to calibrate our dynamic growth path in the same way we would have done if Covid-19 had not struck. This essentially says that we believe the underlying production resources will set both the possible pace of recovery and also the subsequent constraints on growth expansion, and that, in spite of the possibly more erratic than usual ongoing business cycles, we believe Myanmar will ultimately return to a more stable growth path similar to our counterfactual.

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Appendix A: Sensitivity analyses

A1 Macroeconomic scenario impacts without discounting

Table A1: Very long-term macroeconomic impacts of 'no transition' scenarios (MKK1,000' bn in 2017 prices)

	Base	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5		Scenario 6		Scenario 7	
		Δ value	%-change	Δ value	% change	Δ value	% change	Δ value	% change	Δ value	% change	Δ value	% change	Δ value	% change
Real GDP (cumulative)	4,433	−35.9	−0.81	−48.7	−1.10	18.6	0.42	22.3	0.50	8.6	0.19	−39.8	−0.90	0.3	0.01
Private consumption	2,552	−22.1	−0.87	−30.0	−1.18	10.8	0.42	11.5	0.45	0.6	0.02	−32.1	−1.26	−7.4	−0.29
Government consumption	557	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00
Investment	1,468	−13.8	−0.94	−18.7	−1.27	7.8	0.53	10.8	0.73	8.1	0.55	−7.7	−0.53	7.7	0.52
Exports	1,449	−10.8	−0.74	−14.7	−1.01	6.4	0.44	8.7	0.60	7.9	0.55	−3.9	−0.27	8.2	0.57
Imports	1,594	−10.8	−0.68	−14.7	−0.92	6.4	0.40	8.7	0.55	7.9	0.50	−3.9	−0.24	8.2	0.52
	Work years (m)	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change
Labour employment (cumulative)	487.28	−6.07	−1.25	−8.15	−1.67	3.50	0.72	3.71	0.76	0.94	0.19	−6.07	−1.25	0.00	0.00
Uneducated	103.05	−6.07	−5.89	−8.15	−7.91	0.00	0.00	0.00	0.00	0.00	0.00	−14.22	−13.80	−8.15	−7.91
Primary	163.04	0.00	0.00	0.00	0.00	3.50	2.15	0.00	0.00	0.00	0.00	3.50	2.15	3.50	2.15
Secondary	175.08	0.00	0.00	0.00	0.00	0.00	0.00	3.71	2.12	0.00	0.00	3.71	2.12	3.71	2.12
Tertiary	46.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	2.03	0.94	2.03	0.94	2.03

Note: no discount rate applied.

Source: authors' construction based on own calculations.

Table A2: Macroeconomic impacts of ‘transition’ scenarios (MKK1,000’ bn in 2017 prices)

	Base	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5		Scenario 6		Scenario 7	
		Δ value	% change	Δ value	% change	Δ value	% change	Δ value	% change	Δ value	% change	Δ value	% change	Δ value	% change
Real GDP (cumulative)	4,433	−35.9	−0.81	−47.8	−1.08	18.3	0.41	19.2	0.43	3.7	0.08	−46.9	−1.06	−7.1	−0.16
Private consumption	2,552	−22.1	−0.87	−29.4	−1.15	10.6	0.42	9.8	0.38	−1.3	−0.05	−35.1	−1.37	−10.5	−0.41
Government consumption	557	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00
Investment	1,468	−13.8	−0.94	−18.4	−1.25	7.7	0.52	9.5	0.64	4.9	0.33	−11.9	−0.81	3.5	0.24
Exports	1,449	−10.8	−0.74	−14.3	−0.99	6.3	0.43	7.4	0.51	4.5	0.31	−8.3	−0.57	3.7	0.26
Imports	1,594	−10.8	−0.68	−14.3	−0.90	6.3	0.39	7.4	0.47	4.5	0.28	−8.3	−0.52	3.7	0.23
	Work years (m)	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change	Δ work years (m)	% change
Labour employment (cumulative)	487.28	−6.07	−1.25	−7.93	−1.63	3.41	0.70	3.10	0.64	0.54	0.11	−6.95	−1.43	−0.88	−0.18
Uneducated	103.05	−6.07	−5.89	−7.93	−7.69	0.00	0.00	0.00	0.00	0.00	0.00	−14.00	−13.58	−7.93	−7.69
Primary	163.04	0.00	0.00	0.00	0.00	3.41	2.09	0.00	0.00	0.00	0.00	3.41	2.09	3.41	2.09
Secondary	175.08	0.00	0.00	0.00	0.00	0.00	0.00	3.10	1.77	0.00	0.00	3.10	1.77	3.10	1.77
Tertiary	46.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54	1.16	0.54	1.16	0.54	1.16

Note: no discount rate applied.

Source: authors’ construction based on own calculations.

A2 Distributional impacts measured by real household consumption

Similarly to the distributional household income results in Tables 4 and 5 in the main body text, the distributional household consumption results presented in Tables A3 and A4 show that the two costly scenarios 1 and 2 dominate and lead to aggregate reductions in household real consumption in both of the combined scenarios 6 and 7. It should be noted that the scenario-specific sums of disaggregated real household consumption impacts presented in the top line in Tables A3 and A4 differ from the real private consumption impacts presented in Tables 2 and 3.

Table A3: Distributional household consumption impacts of 'transition' scenarios, 2021–40

	Base income	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5		Scenario 6		Scenario 7	
		Δ Income	% change	Δ Income	% change	Δ Income	% change	Δ Income	% change	Δ Income	% change	Δ Income	% change	Δ Income	% change
All households (cumulative)*	1,127.7	−7.6	−0.67	−9.9	−0.88	3.6	0.32	3.0	0.27	−0.3	−0.03	−12.2	−1.08	−3.8	−0.33
Rural households (cumulative)*	684.3	−3.46	−0.51	−4.53	−0.66	1.89	0.28	2.35	0.34	5.07	0.74	0.86	0.13	4.71	0.69
Rural farm 1q	28.0	−0.44	−1.55	−0.58	−2.07	0.30	1.08	0.40	1.43	1.06	3.79	0.63	2.25	1.17	4.16
Rural farm 2q	57.0	−0.55	−0.97	−0.73	−1.28	0.19	0.34	0.26	0.46	0.69	1.21	−0.24	−0.42	0.41	0.71
Rural farm 3q	78.6	−0.27	−0.35	−0.36	−0.46	0.13	0.17	0.33	0.42	0.83	1.06	0.63	0.80	0.93	1.19
Rural farm 4q	106.2	−0.67	−0.63	−0.87	−0.82	0.34	0.32	0.20	0.18	0.12	0.12	−0.97	−0.91	−0.23	−0.21
Rural farm 5q	126.5	0.68	0.53	0.90	0.71	0.50	0.40	0.42	0.34	0.42	0.33	3.13	2.47	2.26	1.79
Rural non-farm 1q	41.9	−0.55	−1.32	−0.73	−1.75	0.19	0.46	0.34	0.82	0.84	2.00	−0.04	−0.08	0.62	1.49
Rural non-farm 2q	54.1	−0.61	−1.12	−0.80	−1.48	0.05	0.09	0.28	0.52	0.79	1.46	−0.40	−0.74	0.31	0.57
Rural non-farm 3q	55.1	−0.31	−0.55	−0.40	−0.73	0.09	0.16	0.07	0.12	0.27	0.49	−0.31	−0.56	0.02	0.04
Rural non-farm 4q	62.7	−0.39	−0.63	−0.52	−0.83	0.09	0.15	0.16	0.25	0.51	0.82	−0.20	−0.31	0.24	0.39
Rural non-farm 5q	74.3	−0.34	−0.46	−0.45	−0.60	0.00	−0.01	−0.12	−0.16	−0.47	−0.63	−1.38	−1.86	−1.03	−1.39
Urban households (cumulative)*	443.4	−4.13	−0.93	−5.39	−1.21	1.69	0.38	0.65	0.15	−5.41	−1.22	−13.05	−2.94	−8.47	−1.91
Urban farm 1q	1.4	−0.06	−4.33	−0.08	−5.60	0.03	2.01	0.03	2.26	0.00	0.19	−0.09	−6.47	−0.02	−1.22
Urban farm 2q	2.3	−0.04	−1.57	−0.05	−2.02	0.01	0.37	0.03	1.25	−0.01	−0.37	−0.06	−2.66	−0.02	−0.79
Urban farm 3q	3.9	−0.11	−2.75	−0.14	−3.54	0.06	1.49	0.07	1.78	0.00	−0.02	−0.14	−3.68	−0.01	−0.35
Urban farm 4q	7.4	−0.06	−0.82	−0.08	−1.06	0.03	0.45	0.02	0.32	−0.04	−0.53	−0.13	−1.76	−0.06	−0.83
Urban farm 5q	20.0	−0.12	−0.62	−0.16	−0.80	0.05	0.24	0.04	0.21	−0.16	−0.80	−0.37	−1.83	−0.23	−1.15
Urban non-farm 1q	12.9	−0.32	−2.45	−0.41	−3.18	0.13	1.04	0.11	0.84	−0.03	−0.23	−0.57	−4.46	−0.20	−1.56
Urban non-farm 2q	27.8	−0.33	−1.20	−0.43	−1.55	0.11	0.41	0.05	0.16	−0.21	−0.74	−0.86	−3.10	−0.48	−1.73
Urban non-farm 3q	46.0	−0.44	−0.96	−0.58	−1.26	0.11	0.23	−0.09	−0.19	−0.30	−0.65	−1.35	−2.94	−0.86	−1.87
Urban non-farm 4q	69.8	−0.64	−0.91	−0.83	−1.19	0.25	0.36	−0.02	−0.03	−0.74	−1.06	−2.04	−2.93	−1.34	−1.92
Urban non-farm 5q	252.1	−2.02	−0.80	−2.64	−1.05	0.90	0.36	0.42	0.17	−3.92	−1.56	−7.44	−2.95	−5.24	−2.08

Note: * 10% discount rate (2017 prices).

Source: authors' construction based on own calculations.

Table A4: Distributional household consumption impacts of ‘no transition’ scenarios, 2021–40

	Base income	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5		Scenario 6		Scenario 7	
		Δ Income	% change	Δ Income	% change	Δ Income	% change	Δ Income	% change	Δ Income	% change	Δ Income	% change	Δ Income	% change
All households (cumulative)*	1,127.7	−7.6	−0.67	−10.3	−0.91	3.7	0.33	4.0	0.35	0.3	0.03	−11.0	−0.97	−2.4	−0.22
Rural households (cumulative)*	684.3	−3.46	−0.51	−4.70	−0.69	1.95	0.29	3.05	0.45	10.76	1.57	7.03	1.03	10.95	1.60
Rural farm 1q	28.0	−0.44	−1.55	−0.60	−2.14	0.31	1.11	0.51	1.82	2.24	7.95	1.88	6.68	2.43	8.65
Rural farm 2q	57.0	−0.55	−0.97	−0.76	−1.33	0.20	0.35	0.34	0.60	1.47	2.57	0.57	1.00	1.23	2.16
Rural farm 3q	78.6	−0.27	−0.35	−0.37	−0.47	0.14	0.18	0.42	0.54	1.74	2.22	1.61	2.05	1.92	2.44
Rural farm 4q	106.2	−0.67	−0.63	−0.91	−0.86	0.35	0.33	0.25	0.24	0.26	0.25	−0.80	−0.75	−0.05	−0.05
Rural farm 5q	126.5	0.68	0.53	0.94	0.74	0.52	0.41	0.54	0.43	0.88	0.70	3.78	2.99	2.90	2.29
Rural non-farm 1q	41.9	−0.55	−1.32	−0.76	−1.81	0.20	0.47	0.44	1.05	1.77	4.21	0.95	2.27	1.63	3.87
Rural non-farm 2q	54.1	−0.61	−1.12	−0.83	−1.54	0.05	0.09	0.37	0.68	1.68	3.10	0.52	0.97	1.25	2.30
Rural non-farm 3q	55.1	−0.31	−0.55	−0.41	−0.75	0.09	0.17	0.09	0.17	0.57	1.04	0.00	0.00	0.34	0.61
Rural non-farm 4q	62.7	−0.39	−0.63	−0.54	−0.86	0.10	0.16	0.21	0.33	1.09	1.73	0.40	0.64	0.85	1.35
Rural non-farm 5q	74.3	−0.34	−0.46	−0.46	−0.62	0.00	0.00	−0.14	−0.19	−0.94	−1.27	−1.89	−2.54	−1.55	−2.08
Urban households (cumulative)*	443.4	−4.13	−0.93	−5.61	−1.27	1.76	0.40	0.93	0.21	−10.47	−2.36	−17.98	−4.06	−13.40	−3.02
Urban farm 1q	1.4	−0.06	−4.33	−0.08	−5.90	0.03	2.11	0.04	2.93	0.01	0.43	−0.08	−5.85	−0.01	−0.52
Urban farm 2q	2.3	−0.04	−1.57	−0.05	−2.13	0.01	0.39	0.04	1.61	−0.02	−0.70	−0.06	−2.75	−0.02	−0.86
Urban farm 3q	3.9	−0.11	−2.75	−0.14	−3.73	0.06	1.56	0.09	2.29	0.00	0.02	−0.13	−3.29	0.00	0.08
Urban farm 4q	7.4	−0.06	−0.82	−0.08	−1.11	0.04	0.47	0.03	0.42	−0.08	−1.05	−0.16	−2.22	−0.10	−1.28
Urban farm 5q	20.0	−0.12	−0.62	−0.17	−0.84	0.05	0.25	0.06	0.28	−0.32	−1.59	−0.51	−2.57	−0.38	−1.90
Urban non-farm 1q	12.9	−0.32	−2.45	−0.43	−3.34	0.14	1.10	0.14	1.11	−0.05	−0.39	−0.58	−4.50	−0.20	−1.56
Urban non-farm 2q	27.8	−0.33	−1.20	−0.45	−1.63	0.12	0.43	0.07	0.24	−0.40	−1.46	−1.05	−3.80	−0.67	−2.43
Urban non-farm 3q	46.0	−0.44	−0.96	−0.60	−1.31	0.11	0.24	−0.10	−0.22	−0.58	−1.27	−1.67	−3.63	−1.18	−2.56
Urban non-farm 4q	69.8	−0.64	−0.91	−0.86	−1.24	0.26	0.38	−0.01	−0.02	−1.46	−2.09	−2.77	−3.98	−2.07	−2.97
Urban non-farm 5q	252.1	−2.02	−0.80	−2.74	−1.09	0.94	0.37	0.58	0.23	−7.56	−3.00	−10.96	−4.36	−8.78	−3.49

Note: * 10% discount rate (2017 prices).

Source: authors’ construction based on own calculations.