From Diet to Productivity: Socio-Economic Effects of Dietary Health via Labor Markets

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In this study, we examined the economic impact of improving health through increased labor productivity. We analyzed how a decrease in avoidable deaths and a decrease in prevalence would impact the economy. A literature review revealed that various diet-related non-communicable diseases affect labor productivity differently. However, a static comparison analysis showed that increasing labor productivity or the labor force by 5% has the same economic impact. This allowed us to translate the various impacts of non-communicable diseases (NCDs) on return to work, absenteeism, and presenteeism into a single, consistent shock to the labor force. A decrease in avoidable deaths positively impacted total GDP in all regions. However, per capita GDP decreased slightly in high-income countries and increased slightly in low- and middle-income countries. These differences result from the fact that populations in high-income countries are older than populations in low- and middle-income countries.

Introduction

Poor diets are responsible for 26% of preventable mortality worldwide (Miller et al., 2022). In 2017 this amounted to around 11 million deaths and 255 million disability-adjusted life-years (DALYs) linked to diets. A low intake of whole grains and fruits was among the leading risk factors contributing to these mortality and morbidity numbers (Afshin et al., 2019). A shift to healthier diets such as the planetary health diet (PHD) can reduce the risk of noncommunicable diseases (NCDs) such as diabetes, cardiovascular disease, and cancer, and thus reverse diet related mortality and morbidity (Rockström et al., 2025). Next to reducing wellbeing the prevalence of NCDs also has a strong impact on the economy. The health costs associated with poor diets are estimated to be at least $11 trillion PPP, which are mainly caused by the negative impact of poor nutrition on labor productivity (Laderchi et al., 2024). Loss in labor productivity takes shape as premature workforce exit, absenteeism, and presenteeism (Ademi et al., 2021).

In this research we are analyzing how diet-related health impacts the labor market and how this impact resonates in the rest of the economy with a focus on the food system. To address this question we are combining the general equilibrium model MAGNET (Woltjer et al., 2014) in combination with a health model called Diet Impact Assessment (DIA) model (Springmann et al., 2018). Our study focusses on incorporating the impact of mortality on workforce exit impacting the total number of workers in our model, and the impact of morbidity on labor productivity (absenteeism and presenteeism). Producers will respond to changes in the available labor force and its productivity by adjusting their production decisions. This results in changes to labor markets (i.e. wages), which, in turn, has an impact on the demand and supply of capital and land. These changes impact commodity and factor market prices affecting the price of food and the wage income available to workers, consequently affecting GDP (growth), income distribution and food affordability.

Methods

The core of MAGNET (Woltjer et al., 2014) is derived from the GTAP v7 model (Corong et al., 2017). MAGNET is extended in the domain of the bioeconomy and agriculture. Key extensions are the endogenous land supply module and the segmentation of agricultural and non-agricultural factor markets (Van Meijl et al., 2006). Important extensions of MAGNET relevant for this study are the diet module and tracking of changes in daily wages by worker and sector. The diet module allows the derivation of the food consumption in physical units (such as in grams and kcal) by tracing all direct and indirect material flows of food consumption by deriving the Leontief Inverse (LI) from consistent material flows (de Lange et al., 2025). Post-simulation calculations of daily wage wages per worker in comparison to minimum diets costs allows assessing a detailed and fully endogenous assessment of the distributional impacts in terms of wage distribution and accessibility of healthier diets (Kuiper et al., 2025).

To derive the impact of the consumed diet on morbidity and mortality, we will use the Diet Impact Assessment (DIA) model (Rockström et al., 2025; Springmann et al., 2018). For the diet related risk factors meat, red meat, fruit, vegetables, nuts, seeds, whole grains, underweight (15<BMI<18.5), overweight (25<BMI<30), and obesity (30<BMI<35) the population impact factors (PIFs) were derived for the non-communicable diseases (NCDs): coronary heart disease (CHD), stroke, colorectal cancer, type 2 diabetes, and respiratory disease. Combining these PIFs with statistics on the disease-specific death rates and the population composition allows derivation of the change in number of deaths induced by a change in diet per sex and age group (Rockström et al., 2025; Springmann et al., 2018). In the same way, by using statistics of the prevalence of the above mentioned NCDs from the Global Burden Disease (GBD) database (vizhub.healthdata.org/gbd-results), changes in morbidity can be derived. To derive the PIFs, per disease and risk factor (the amount of consumption per food group and BMI level) relative risk parameters from a meta-analysis of the literature will be used.

Knowing the mortality and the morbidity of the population per NDC, sex, and age group, we are deriving the impact of diet related health on labor markets via both labor force participation (labor supply) and labor productivity, focusing on the working-age population between 15 and 64 years. The impact on the labor force participation will be derived by subtracting the change in the number of deaths caused by the change in diets between 15 and 64 years from the labor supply. The impact of morbidity on labor productivity will be derived using disease specific productivity indices from the literature.

The productivity indices are based on cohort studies (such as Bommer et al. (2017)). The indices range from 0 to 1, with 0 completely unproductive and 1 completely productivity. The share in morbidity of the total work force per NDC was then used to derive the mean change in productivity indices of the total work force to shock labor productivity in the model. We assume no interaction effects between the NDC related productivity indices.

To analyze the impact of dietary health on labor markets and the rest of the economy, we are running a Business-as-usual scenario, a PHD scenario, and a policy bundle scenario by implementing fiscal policies and nudging and information (see Kuiper et al., 2025) to encourage the uptake of the PHD, using the MAGNET model. These scenarios will be run with and without the impact of dietary health on the labor markets. By comparing these scenarios, we can analyze the impact of a change in dietary health on the economy. Additionally, we compared our dynamic approach with a static approach. For the static approach, a common approach in the literature (e.g. Afroz et al., 2020), we derived the total effective labor lost in full time equivalent (FTE) by taking the sum of lost in labor due to mortality and productivity loss due to morbidity and multiplying this with the GDP per FTE generated. Lastly, we will conduct sensitivity analyses on the assumptions how morbidity impact the labor market. For example, we will derive scenarios where absenteeism is count as lost in labor force participation instead of reduced labor productivity.

Scenarios

Impact prevalence on labour productivity

As earlier mentioned, prevalence of diet related NCD has an impact on labor productivity due to absenteeism, presenteeism and labor force participation. There is extensive literature on the impact of NCDs on labor productivity, however the literature is scattered and for some NCDs the literature is limited.

Stroke

Limited literature is found on the impact of stroke on return to work, absenteeism and presenteeism of stroke patients. A meta-analysis published (Orange et al., 2024) found RTW of workers who had a stroke is 50.9% globally and ranges between 33% (24-43%) in South America to 64% (51-65%) in Oceania. Kwok et al. (2025) conducted a meta-analysis on RTW among young adults (≤50 years) and found a higher overall RTW of 63.2% without significant differences between the subgroups who had a stroke less than two years ago (65.0%) and more than two years ago (61.6%). Westerlind et al. (2017) found that in a Swedish cohort, RTW is increasing to 74.7% until 3 years post stroke and stabilize from this period.

We found only one systematic review reporting presenteeism and absenteeism expressed in loss in time (Martín-Gutiérrez et al., 2026). Absenteeism was 62.1 days and presenteeism was 10.1 among ischemic stroke patient one year after the event.

Coronary heart disease (CHD)

Two systematic analyses (Kai et al., 2022; Sadeghi et al., 2022) reported the return to work among individuals who experienced a cardiac event. The RTW among cardiac patients was 66% of patient receiving cardiac rehabilitation and 58% of the patients who didn't received cardiac rehabilitation (Sadeghi et al., 2022). Among workers experienced a coronary heart disease the RTW was 81.1% (Kai et al., 2022). Over time the RTW increased from 47% after 0-3 months to 88% after 3-6 months, and gradually decreased and stabilized to 77% after 6-12 and 80% after over 12 months.

No systematic literature reviews or meta-analyses were found reporting absenteeism and presenteeism in time units or relative productivity loss. A US cohort study (Goetzel et al., 2004) reported 6.8% of productivity shortfall (presenteeism) and absenteeism 6.8 days of absenteeism per year. A cross-sectional study in Europe reported work days loss of 53 days of absenteeism, 6 days of presenteeism in workers and 11 days of caregiver loss after one your of a the coronary event (Kotseva et al., 2019). A Finnish cohort reported absenteeism of 39.8 mean days lost over 6 years and 12.8 of presenteeism (Singh-Manoux et al., 2010). A Dutch cohort study found that 92% of the workers RTW after 12 to 18 months of a cardiovascular event with an median absenteeism duration of 119 working days.

Cancer

Although there is wide dispersion (20-70%) in RTW rates reported in the literature, Sharipova & Baert (2019) found that nonetheless this dispersion, five review papers reported average RTW rates between 54% and 66%. These review papers where published between 2002 and 2013. Later systematic reviews found that RTW ranges between 39 to 77% in Europe (Paltrinieri et al., 2018), while De Boer et al. (2020) found RTW 2+ years post-diagnoses of 0.74% (0.69, 0.79) for Europe, 0.75% (0.68, 0.81) for North-America and 0.66% (0.62, 0.70) for other regions. These results suggest that over the last decades the RTW of cancer survivors has increased as a result of improvements in cancer health care (SOURCE).

During the first five years after a cancer diagnosis, the absenteeism of cancer survivors is higher compared to control groups. However, after five years, absenteeism is same for cancer survivors and the control groups (Soejima & Kamibeppu, 2016). For example Lloyd et al. (2025) found that absenteeism among individuals with breast cancer is 82 days per year in the first 5-years after the diagnosis and decreased after 5 years to 22 days per year, while Kamano et al. (2025) found that absenteeism of cancer survivors workers was in the first year 19.1 days per year which dropped to 4.6 days per year, which was comparable with workers with no history of cancer (4.6 days per year). A cohort study in Japan (Ohno et al., 2020) found that cancer patients who were diagnosed with cancer had a shortfall in absenteeism of 5.13% for all type of cancer and 4.42% for colorectal cancer compared to 2.68% for the control group. Another study reported that absenteeism rate among cancer survivors is 33% compared to individuals without a severe disease (Ali et al., 2026). In both studies it was not clear how long before the cancer patients were diagnosed.

In contrast to absenteeism, presenteeism seems remaining higher among cancer survivors in the long run (after 5 years) due to complications related to chronical damage of the cancer or the therapy (Soejima et al, 2016; SOURCE!!!). The reported impact of cancer on presenteeism varied from small impacts (shortfall of 21.99% compare to 20.29% in the control group) to presenteeism was twice as high among cancer survivors. A study workers who had breast cancer found presenteeism was 36 days out of 240 working days within the first 5 years after the diagnose and 44 days out of 240 working days after 5 year of the diagnose.

Diabetes

Compared to workers who had a stroke or cancer, the absenteeism of diabetes patients is substantially lower and varied between 5.4 and 18.1 days per year compared to 3.4 to 8.7 days per year (Breton et al., 2013). The only meta-analysis found on absenteeism and presenteeism among diabetic patient Bommer et al. (2017) reported that absenteeism was between 1.9-10.2 days per year higher than among workers without diabetes. The short fall of presenteeism among diabetes workers is between 0.3% and 1% (corresponds to 0.72 and 2.4 working days respectively). Absenteeism and presenteeism was higher among female workers compared to male workers and also higher in low and middle income countries compared to high income countries. A cohort study among healthcare workers in the USA (Tabano et al., 2018) found diabetes resulted in around two times higher presenteeism rates compared (0.69 hours per week compared to 1.11 hours per week) which corresponds to 3.6 additional loss of days per year. The USA cohort study didn't found significant differences in absenteeism between workers with and without diabetes.

Results

Static comparison between impact increasing labor force and labor productivity by 5%

Prior to the main analyses, we examined how the increase in labor productivity and the increase in labor markets impact the economy differently. Using a static comparative approach, we shocked labor productivity and the labor force with a 5% increase, respectively. To make both scenarios comparable, we exogenized the labor force in the labor productivity scenario in line with the labor force scenario.

Both scenarios had the same impact on total real GDP, leading to a real GDP growth between 1.7% and 3.9%. China had the strongest GDP growth (3.9%), while Mexico had the lowest increase in real GDP (1.7%). Comparing the impact of the two different scenarios, the impact on value production, value of intermediate use, and prices differ. For example, in all regions, the wages of low skilled labor decreased between -1.7% and -6.4% and the wages of skilled labor decreased between -0.46% and -2.4%. Under the labor force scenario, wages of low skilled labor increased in 0.41 and 0.9% in the regions ANZ, CAN, EUR and USA, and decreased with a lower rate under the labor productivity scenario in the other regions. The nominal wages for skilled labor decreased. The wages of high-skilled labor increased in all regions with between 0.02% and 1.3%. The decrease in wages under the labor force scenario is the result labor is more abundant, making the use of labor production systems cheaper. In contrast, the increase in productivity per unit of labor results to a general increase of wages under the labor productivity scenario.

However, comparing the relative changes, there can be observed that all indicators expressed in monetary values and prices are consistently around 2.3% lower in the labor productivity scenario compared to the labor force scenario. In contrast, indicators expressed in physical units, such as land use in ha and yield per ton/ha, as well as the current net rate of return of capital stock are the same for the two scenarios. These results show that imposing a shock with the same magnitude on labor productivity or on the labor force doesn't lead to different impacts on the structure of the economy, economic growth and physical production or input use. For now one we will only discuss the results of the labor force scenario.

Looking at environmental indicators, we see that land use increased the strongest in upper-middle income south east Asia (1.7%), Indonesia (0.9%), Brazil (0.8%) and lower-income south east Asia (0.7%). Land productivity increase in all regions, except of high income Europe, USA and high income South-East Asia (between -0.01% and -0.08%). The increase in yields was the highest in Brazil (1.8%) and Turkey (1.7%). In all other regions the change was between -0.2% and 0.5%. This is in line with the change in fertilizer use. Fertilizer use decreased in high income countries, while strong the highest increased can be observed in Turkey (+3.1%), India (+3.1%), and Brazil (+2.6%). GHG emissions increased the most in China (3.1%) and India (2.6%). In all other regions the increase in emission was between 0.8% and 2.1%.

Conclusion

In this study, we analyzed the impact of improving health on the economy through an increase in effective labor productivity. A literature review showed that different diet-related non-communicable diseases impact labor productivity in different ways. The average per capita impact of a stroke is the highest, leading to a 50% decrease in labor productivity due to absenteeism. The decrease in labor productivity caused by coronary heart disease was the most conservative at around 20%. Productivity loss induced by absenteeism among cancer patients was around 25% two years after cancer diagnosis.

A static comparison analysis showed that increasing labor productivity or the labor force by 5% has the same economic impact. However, although the monetary values and prices were consistently around 2.3% lower in the labor productivity scenario than in the labor force scenario, the GDP growth and the structure of the economy were the same, as were the physical indicators (such as land use and GHG emissions). Therefore, in this research, we chose to solely shock the labor force and express the change in effective labor productivity as a change in full-time equivalents (FTEs). This allows the various impacts of NCDs on return to work, absenteeism and presenteeism to be translated into a single consistent shock to the labor force.

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