



Intended and Unintended Impacts of Minimum Wage Change and
Foreign Direct Investment:
A Computable General Equilibrium Model Analysis with Cross-border Factor
Mobility in the Philippines

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Abstract

Factor mobility plays an important role in the efficiency of labor and capital markets. Free movement of labor and capital across borders enables countries to adjust and be more resilient when faced with policy changes and economic shocks, such as a minimum wage increase or a modified foreign investment law. On the one hand, the minimum wage is used as a support for low-wage workers, but it is expected to decrease domestic employment and welfare of the workers who lose their jobs. While earlier studies identify the negative side effects of minimum wage, that may not be the case in the Philippines, where many workers migrate and send home large remittances. On the other hand, although foreign direct investments (FDIs) are expected to enrich household welfare by facilitating job creation and production, they may also cause unintended outcomes.

To tackle these issues, my first study in chapter 3 uses a static computable general equilibrium (CGE) model to examine the impacts of an increase in the domestic minimum wage on output, domestic employment, international migration, household welfare, and inequality in the Philippines. My static model simulation results show that a minimum wage increase would indeed reduce domestic labor demand and prompt many workers, especially unskilled ones, who lose jobs to migrate out, resulting in a stagnant domestic industry. Migration promoted by lower domestic employment gives rise to higher remittances that would improve the welfare of all household groups. However, the inequality incidence would neither be improved nor exacerbated. The minimum wage increase would have unintended effects, such as currency appreciation, decreased output in labor-intensive and export-oriented industries, and tax base erosion.

My second study in Chapter 4 extends the static CGE model into a recursive dynamic CGE model and integrates an exogenous FDI component. I simulate both an increase in the minimum wage and FDI and determine its impact on the macroeconomy, while examining FDI as a tool to neutralize the negative employment effects of the minimum wage increase. My dynamic model simulation results show that FDI is expected to re-attract workers, especially unskilled ones, who have migrated out due to the minimum wage increase. While migrant remittances would contribute to household income in the short run, FDI would address the reduced employment problem and create jobs in the long run since foreign capital accumulation would take time. The FDI increase would not only affect FDI-host sectors, such as manufacturing, wholesale and retail trade, and service sectors but also indirectly impact the agriculture sector because foreign capital would replace domestic capital in FDI-host sectors, and domestic capital would be reallocated to the agriculture sector. Due to the positive income changes arising from higher employment in domestic industries, the welfare of all household groups would be enhanced, but the inequality incidence would remain unchanged. The positive impact of FDI on domestic employment and production in the domestic industries would lessen cross-border migration and widen the tax base, successfully addressing the ramifications of the minimum wage increase. Lastly, FDI promotion would mitigate the distortionary effects of the minimum wage increase in the labor market.

As I expect unintended outcomes in my policy experiments, the Philippine government should formulate policies to enhance the country's investment climate and sustain the growth of FDI. The government must provide more efficient and transparent public service to facilitate doing business in the country. The effects of these policy measures should be examined in a general equilibrium structure as well.

Dedication

To my father Mr. Bun Tun Pedro Wong Sy

and

my mother Rosa So Sy

Acknowledgments

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Acronyms and Abbreviations

BG-BAU	Balanced Growth Business-As-Usual
BSP	Bangko Sentral ng Pilipinas (Central Bank of the Philippines)
CD	Cobb-Douglas
CET	Constant Elasticity of Transformation
CES	Constant Elasticity of Substitution
CGE	Computable General Equilibrium
DSGE	Dynamic Stochastic General Equilibrium
DOLE	Department of Labor and Employment
EV	Equivalent Variation
FDI	Foreign Direct Investment
FINL	Foreign Investment Negative List
GTAP	Global Trade Analysis Project
ILO	International Labour Organization
IO	Input-Output
NCR	National Capital Region
OECD	Organization of Economic Co-operation and Development
OFW	Overseas Filipino Worker
PSA	Philippine Statistics Authority
PSE	Philippine Stock Exchange
SAM	Social Accounting Matrix
SOF	Survey of Overseas Filipinos

1. Introduction

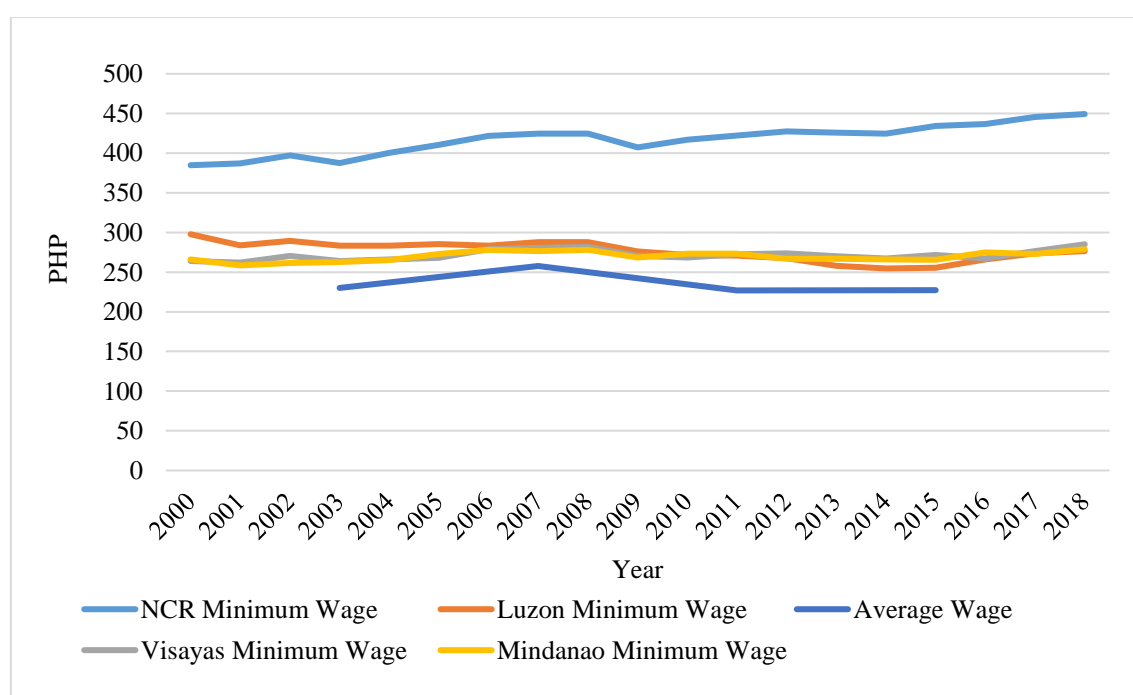
1.1. General Background

The first wave of globalization and industrialization took over the world in the 18th century. It paved the way for the trade of goods and services. Differences in trade patterns are attributed to differences in factor endowments, as shown by the Heckscher–Ohlin (HO) model. Labor-rich countries, often classified as developing countries, produce and export labor-intensive goods to capital-rich or developed countries. This theory presumes that factors are confined in the original countries due to a high mobility barrier. However, the recent revolutionary improvements in transportation and communication technology have lowered their barriers and allowed cheaper labor transfer from developing countries with abundant labor to developed countries that need additional manpower. On the other hand, wealthier nations can provide excess capital to emerging economies that typically need it for investment. Thus, migration and foreign direct investment (FDI) have been growing fast thanks to the improvements in technologies and institutional developments in the globalized world; their mobility allows economies to use resources more efficiently and boost economic growth further. Factor mobility allows the free flow of labor and capital; the labor and capital flows occur in the opposite direction of the trade flows of labor-intensive and capital-intensive goods predicted by the HO model, respectively.

Many developing countries, such as the Philippines, are richly endowed with labor. The comparative advantage in labor-intensive industries would suggest that the Philippines suffers from low wages, poverty, and inequality. The Philippine government

uses the minimum wage as a policy intervention tool to mitigate these problems, instead of direct cash transfers or wage subsidies, which would incur fiscal costs. The (nominal) minimum wage is set every year based on the poverty threshold, prevailing average wages, and socioeconomic indicators such as the consumer price index (CPI) and regional gross domestic product (GDP) (Department of Labor and Employment (DOLE), n.d.). The minimum wage was raised by 3.4 percent during 2011–2018, but only around one percent per annum in real terms (Figure 1.1), which leads me to the question of whether a minimum wage increase would improve welfare in developing countries.

Figure 1.1. Historical Real Average and Minimum Wages in the Philippines in 2000–2018 [Unit: PHP].

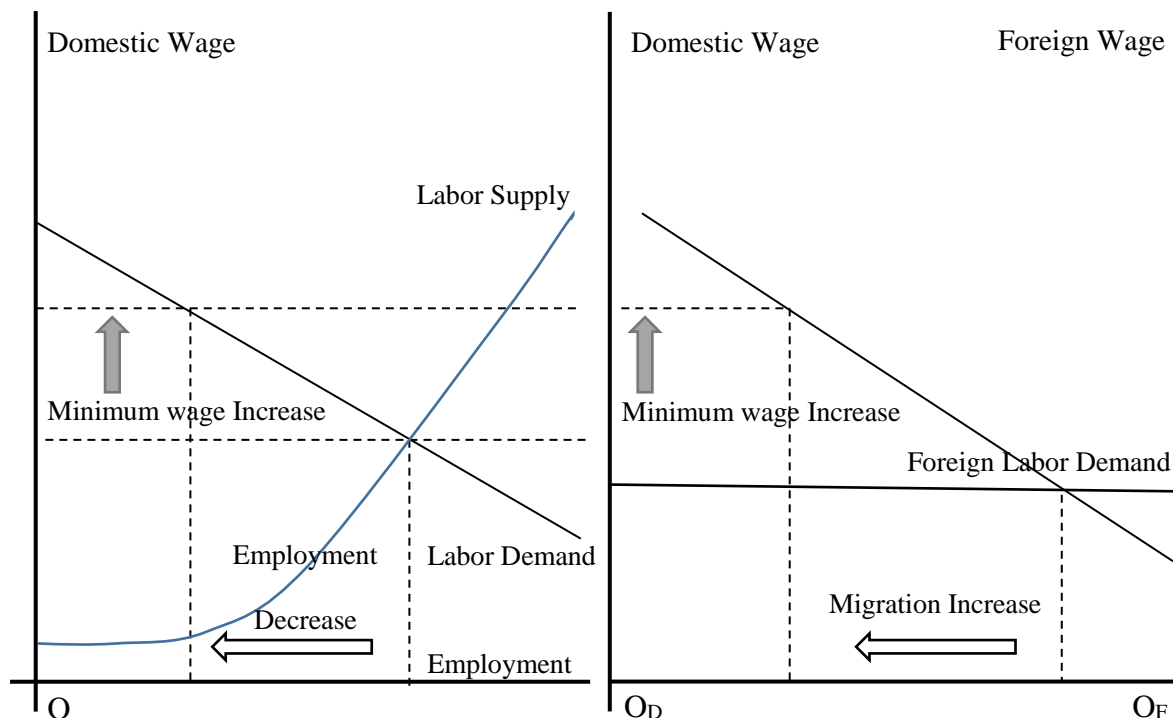


Source: Author’s Computation using Nominal Minimum Wage Data from National Wages and Productivity Commission (NWPC) and Core CPI data from Philippine Statistics Authority (PSA).

The standard economic theory maintains that increasing the minimum wage would lead to lower domestic employment in a closed economy when the minimum wage is below the average or market-clearing wage. Harris & Todaro (1970) demonstrate how wage rigidities like the minimum wage would trigger unemployment in a two-sector economy (i.e., rural and urban) because of internal migration. Low-wage workers (Neumark et al., 2004) and young adults aged 20 to 24 (Brown et al., 1983) particularly suffer from small unemployment effects. A meta-analysis by Martínez & Martínez (2021) finds that the effect of minimum wage on domestic employment is negative and statistically significant for both developed and developing countries. In the case of the Philippines, a minimum wage increase indeed results in lower domestic employment (Lanzona, 2014), not only for Filipinos earning the minimum wage but also for those earning 50 percent more than the minimum wage (Canales, 2014). According to the International Labour Organization (ILO) (n.d.a), a more comprehensive range of workers may be affected because employers may wish to maintain a difference in job status (i.e., providing higher wages for workers with more skills or experience).

The mechanism by which the minimum wage affects household welfare is as follows. In a closed economy model, a decrease in domestic employment due to a minimum wage increase gives rise to domestic labor income losses and may harm the domestic industry (left panel of Figure 1.2). By contrast, under the Harris & Todaro (1970) model setup, wherein domestic and foreign employment are measured from the origins of domestic workers O_D and foreign workers O_F , respectively (right panel of Figure 1.2), unemployed workers can migrate and send a portion of their earnings abroad to their families at home. Lost domestic wages would compensate for remittances; domestically employed workers can enjoy higher wages. The result is a net income gain.

Figure 1.2. Impacts of Minimum Wage Increase on Labor Markets with and without a Migration Option.



Note: The foreign labor demand curve determines the level of foreign wages net of negative premiums of migration (i.e., moving costs, higher living expenses abroad, disutility caused by being away from family, among others). In the right panel of Figure 1.2, the total labor supply is constant, represented by the distance from O_D to O_F .

The migration option is readily available for many Filipinos, who go abroad seamlessly with strong support from the government. The Migrant Workers and Overseas Filipino Act of 1995 ensures that the rights and interests of distressed Overseas Filipino Workers (OFWs) are adequately safeguarded. The law covers migrant support services and provides free access to courts, quasi-judicial bodies and adequate legal assistance to OFWs, among others. The government is responsible for the repatriation of migrant

workers in cases of war, epidemic, or disasters (International Organization for Migration, 2018). To protect the group of Household Service Workers (HSW), which is the largest group of OFWs, the Philippine Overseas Employment Administration (POEA) implements the HSW reform that requires OFWs to be 23 years old or older, and to receive a minimum monthly salary of 400 USD, among others (Philippine Institute for Development Studies, 2012). Several government agencies have been formed to support overseas migration activities. The Commission on Filipinos Overseas reports information on age, gender, occupation, education, place of origin, and destination country of migrants. The POEA manages the recruitment and deployment process, while the Overseas Workers Welfare Administration (OWWA) facilitates welfare services to OFWs (International Organization for Migration, 2018).

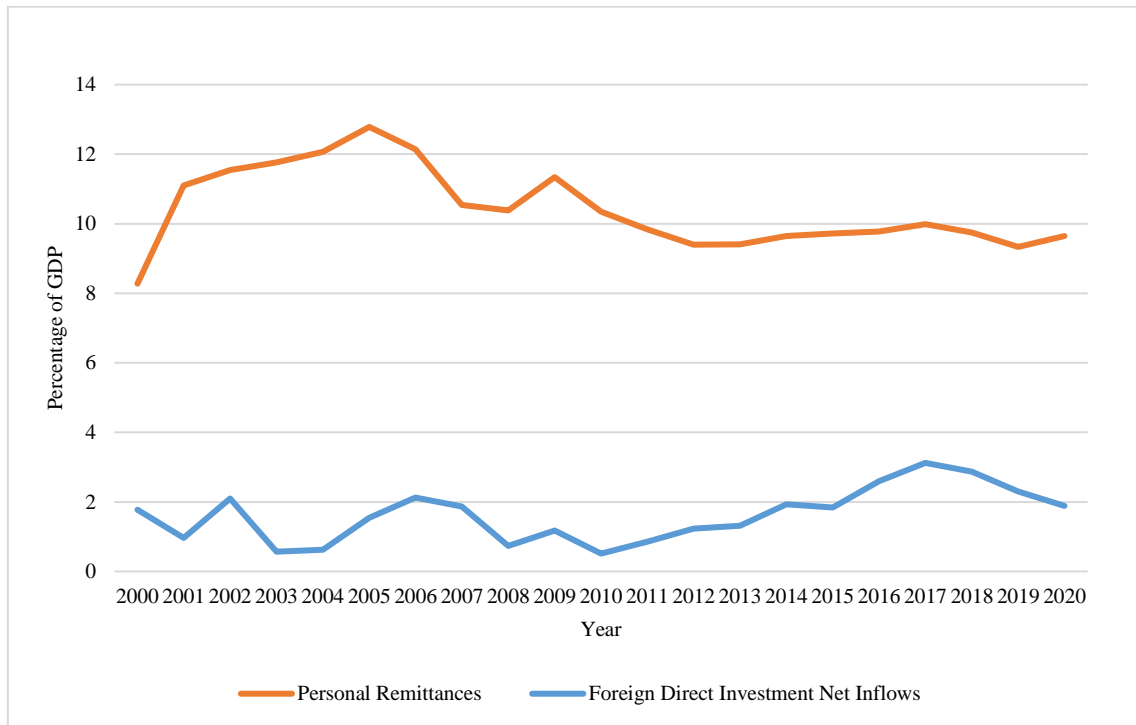
Most Filipinos temporarily migrate for work and return to the Philippines after the completion of their employment contracts (i.e., temporary migration).¹ Only 1.4 percent of households in the Philippines have family members permanently living abroad. By contrast, 12 percent of Filipino households send family members overseas (Philippine Statistics Authority (PSA), 2020a); around 1.77 million OFWs who worked abroad in 2020 (PSA, 2022) sent back large remittances, which reached 9.6 percent of the country's GDP in the same year, providing recipient households an alternative source of income. The large amount of remittances stimulates the macroeconomy and maintains the foreign

¹ Out of all 10 million Filipinos who migrated in 2013, permanent, temporary, and irregular migration accounted for 48, 41, and 11 percent, respectively (Commission on Filipinos Overseas, n.d.). Incidentally, irregular migrants are Filipinos without valid residence or work permits or those overstaying as workers or tourists in a foreign country.

exchange reserves (Thomson Reuters, 2022) despite the country's recurring fiscal deficits and trade imbalances. Remittances have been the most important source of foreign exchange, surpassing FDI (Figure 1.3), portfolio investment, net development flows, and gross domestic savings (Ang et al., 2009).

While international remittances constitute a significant portion of the country's GDP, remittance income benefits only households with migrants abroad and thus may trigger inequality between households with and without migrants. Three studies have found differences in household income caused by remittances received from temporary Filipino migrants. In 2000, Gorodzeisky & Semyonov (2014) find an almost two-fold per capita income differential between Filipino households with migrants and those without. In 2006, the average annual income of remittance-recipient households exceeds that of non-recipient households by 73 percent (Ang et al., 2009). Thus, inward remittances have greatly helped many Filipino families expand their income. However, Ohira & Firshan (2022) find that only families with a certain income level can afford to migrate for work and send home remittances. Thus, they conclude that inward remittances would worsen the inequality incidence among Filipino households. By contrast, Azizi (2021) finds that remittances increase the income of poor Filipino households more significantly, thereby improving the inequality incidence. The existing literature does not necessarily provide conclusive results as to whether remittances do improve the inequality incidence even within the context of the Philippines.

Figure 1.3. Personal Remittances and FDI as a Percentage of GDP.

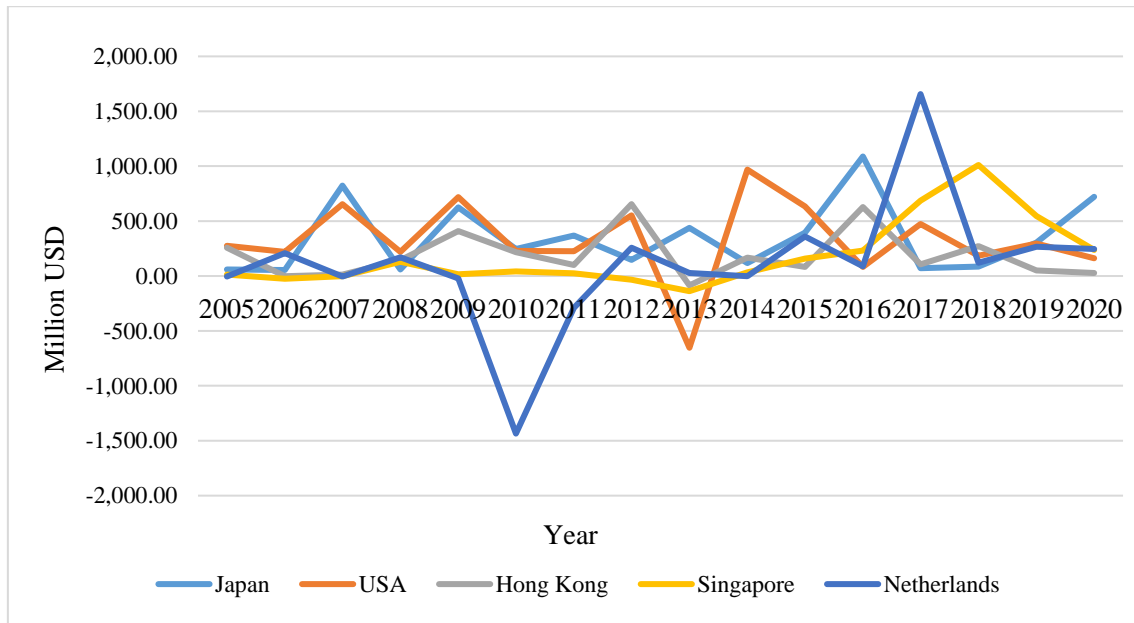


Source: World Development Indicators, World Bank

While international remittances have been crucial to Filipino households, their significance as the country's top source of external financing is gradually declining as its level as a percentage of GDP has been on a downward trend through the years (Figure 1.3). On the other hand, FDI, as an alternative source of capital, grows relatively more important due to the integration of the Philippine economy into the global market. Foreign direct investments or FDIs, by definition, are international capital inflows from the foreign sector aiming to gain an ownership stake in a domestic firm. Unlike portfolio investments that are usually temporary and short-lived, FDI is considered a long-term investment. Thus, cross-border capital inflows in the form of FDI are often employed by the Philippines to expand small-to-medium businesses and further develop the domestic

industry in the long run. In 2020, the Philippines received the largest FDI from Japan at 720 million USD, followed by the Netherlands, Singapore, and the U.S.A. (Figure 1.4).

Figure 1.4. Net Inflows of Foreign Direct Investment by Country of Origin [Unit: Million USD].

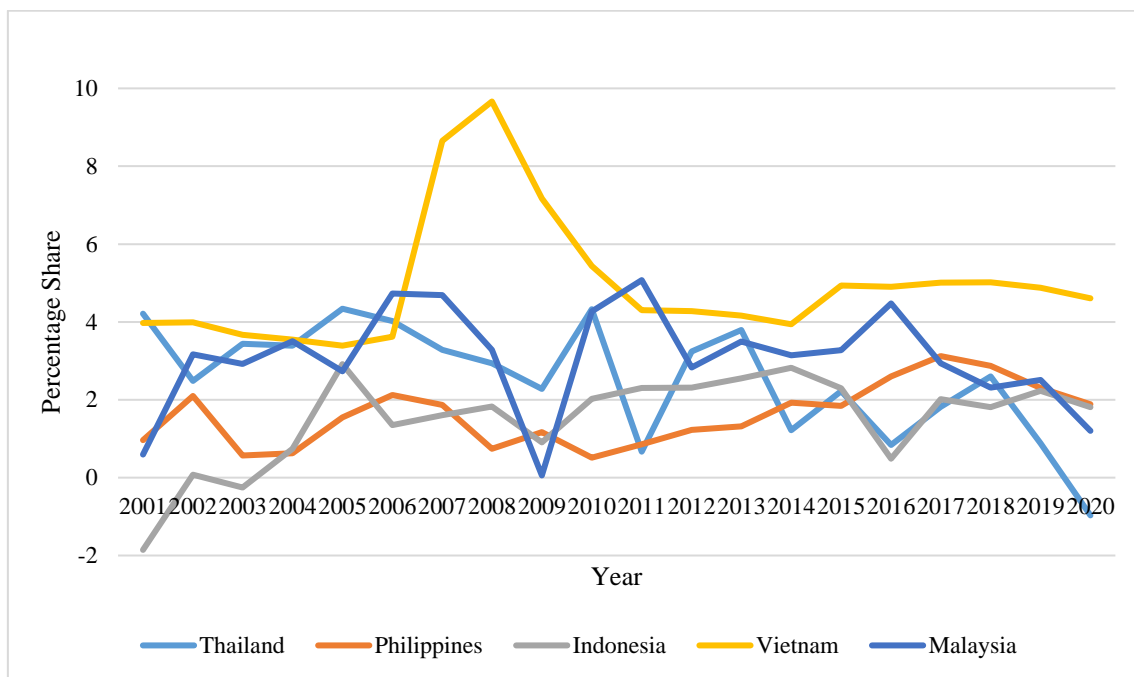


Source: Data from the Bangko Sentral ng Pilipinas (BSP) (Central Bank of the Philippines).

The growth in foreign investments of countries in the ASEAN region was remarkable in the past decade, but the Philippines has lagged behind its regional rivals since the early 2000s (Figure 1.5), which implies that there is a lot more room and potential for FDI to expand and thrive in the Philippine economy as long as the Philippines can remove obstacles to FDI. For example, significant barriers to FDI include limitation on foreign equity in land ownership, utilization of natural resources, and management of public utilities and private radio communications, among others, under

Philippine laws. Foreign ownership is prohibited in sectors stated in the Foreign Investment Negative List (FINL), such as mass media, the practice of professions, small-scale mining, and retail trade enterprises with paid-up capital of less than 2.5 million USD, among others (Aldaba & Quejada, 2022). FDI inflows are also negatively influenced by factors that determine the business environment, such as inadequate infrastructure, high electricity costs, sluggish broadband connections, road and port congestion, corruption, and an unfair justice system (United States Department of State, 2022).

Figure 1.5. Net Inflows of Foreign Direct Investment as a Percentage of GDP.



Source: World Development Indicators, World Bank

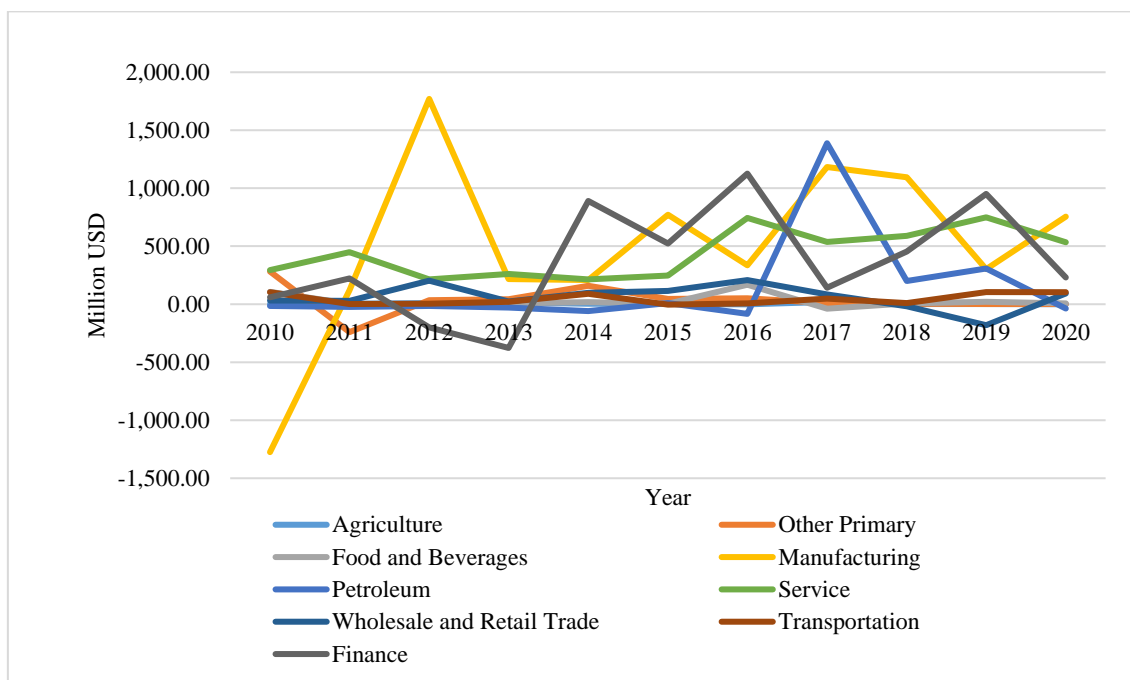
The Philippine government plans to amend the laws mentioned above and FINL that restrict foreign ownership in order to attract more foreign investors. For example, amendments in the Foreign Investment Act increase foreign investors' ownership limit of

small-medium businesses to 100 percent as long as the businesses abide by the required number of local workers (United Nations Conference on Trade and Development (UNCTAD), 2022). Another is the Retail Trade Liberalization Act, which allows foreign investors to own 100 percent of retail businesses with a minimum capital requirement of 7.5 million USD (Aldaba & Quejada, 2022). Lastly, the Public Service Act has been revised to allow foreigners to own businesses in key sectors such as telecommunications, airlines, domestic shipping, and railways (UNCTAD, 2021). These recent amendments not only loosen the rigorous requirements for international investors to consider the country as a potential investment location but also indicate the potential industries they should invest in to maximize their returns.

FDI inflows increased by 120 percent in 10 years between 2011 and 2020 compared with 91 percent between 2001 and 2010 (Beltran, 2022).² In 2021, FDI net inflows increased by 54 percent to 10.5 billion USD, surpassing the previous high of 10.3 billion USD in 2017. The industries that received the most FDI were the manufacturing, finance, and service sectors (Figure 1.6) (Bangko Sentral ng Pilipinas (BSP), 2022), which are among the top value-adding industries reported in the 2018 Census of the Philippine Business and Industry (CPBI) (Figure 1.7). Moreover, manufacturing, service, and exportation of goods and services are some of the activities the Philippine government considers crucial to the country's development based on the Investment Priorities Plan of 2020 (Official Gazette of the Philippines, 2020).

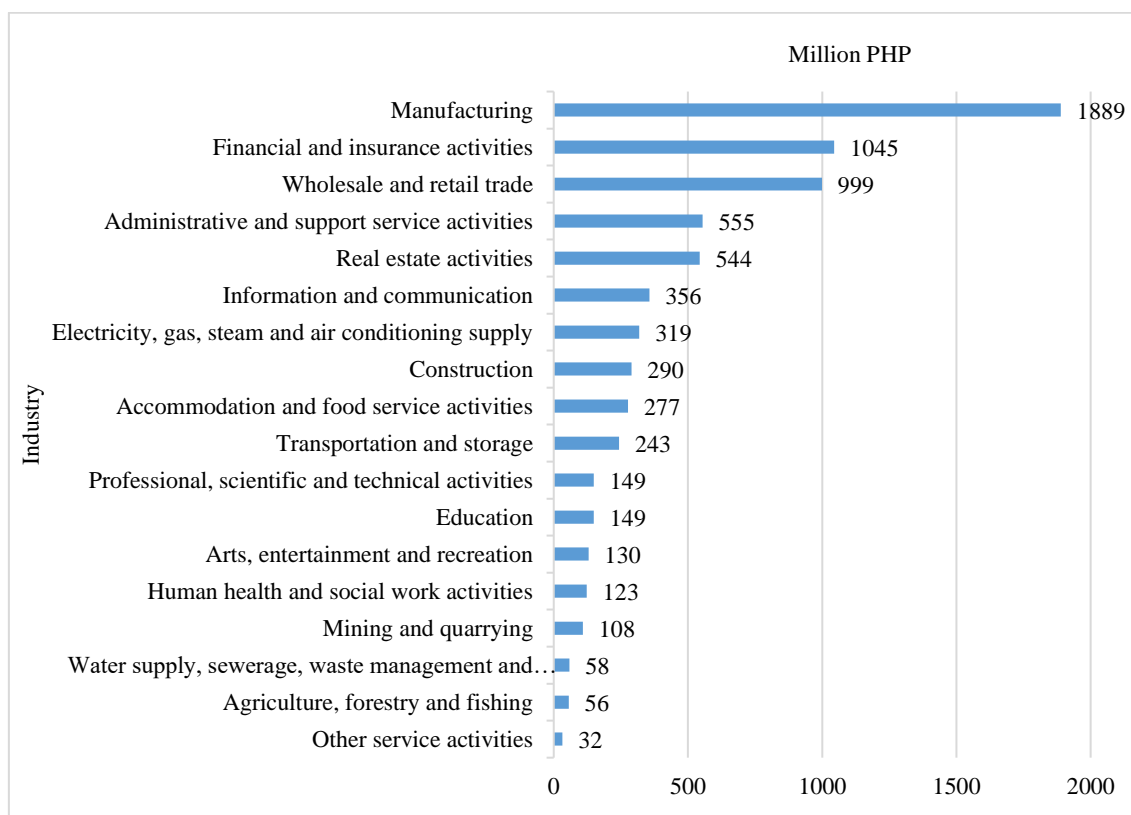
² The percentage of FDI increase is computed by the change between aggregate FDI during 2011 to 2015 and during 2016 to 2020 in comparison with the aggregate FDI during 2001 to 2005 and during 2006 to 2010 using data from the World Bank.

Figure 1.6. Foreign Direct Investments by Industry in 2010–2020 [Unit: Million USD].



Source: Data from the Bangko Sentral ng Pilipinas (BSP) (Central Bank of the Philippines).

Figure 1.7. Value Added by Industry in 2018 [Unit: Million PHP].

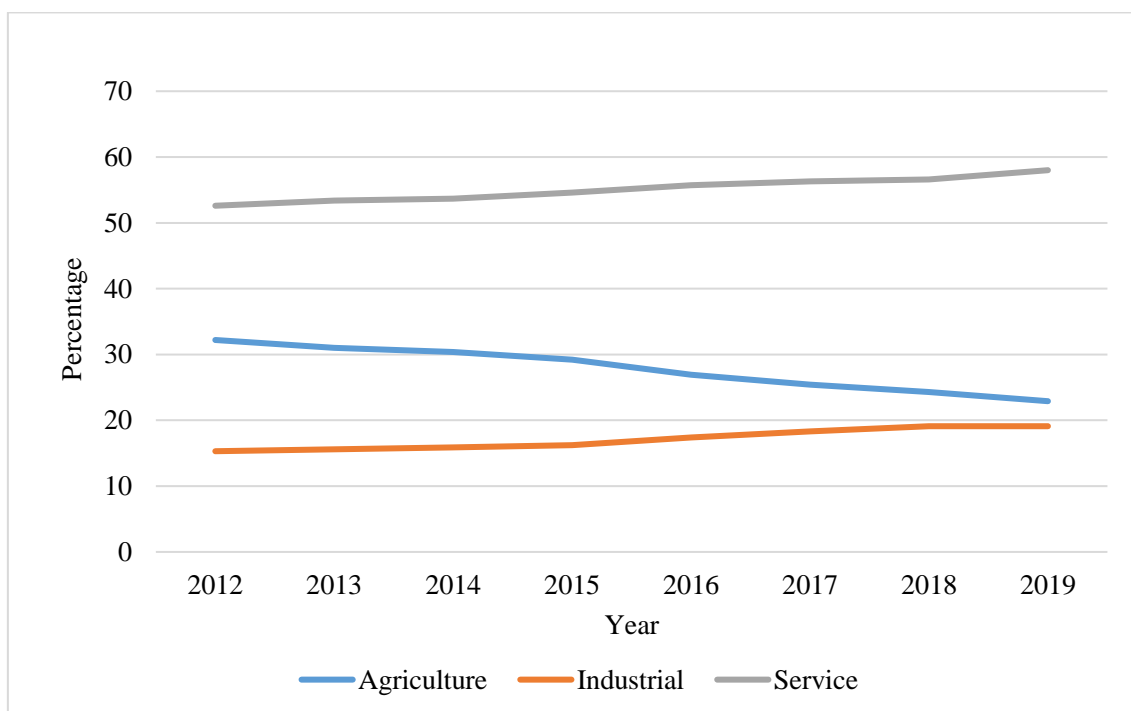


Source: 2018 Census of the Philippine Business and Industry (CPBI)

In the Philippines, FDI is expected to bring spillover effects to labor-intensive sectors, such as the service sector and their unskilled workers. The service sector employs more workers than the agriculture or industrial sectors (Figure 1.8), and 80 percent of those are unskilled workers (World Bank, 2013). The service sector's projected employment from both domestic and foreign investments is the largest among sectors and is driven by administrative and support service (54,200 jobs), real estate (27,300 jobs), information and communication technology (ICT) (9,800 jobs), and construction activities (6,500 jobs) in 2018 (PSA, n.d.a). The labor-intensive textile industry, for example, is associated with rising unskilled wages (Organisation for Economic Co-

operation and Development (OECD), 1999). Thus, FDI inflows are expected to increase domestic employment, especially for unskilled workers, and significantly benefit the Philippine service sector. The agriculture sector, on the other hand, employs one-third of domestic workers with 3,300 jobs, while the industrial sector only plays a relatively minor role.

Figure 1.8. Historical Domestic Employment in Agriculture, Industrial, and Service Sectors [Unit: Percentage of Total Employment].



Source: World Development Indicators, World Bank

1.2. Research Questions

The dissertation aims to answer the following questions:

1. What is the effect of a minimum wage increase on the Philippine economy in terms of output, domestic employment, international migration, household welfare, and inequality? Which sectors are the most affected? Are there any unintended outcomes?
2. How much FDI percentage increase would counterbalance the outward migration effect of the minimum wage increase in the Philippine economy?
3. What is the effect of FDI and minimum wage increase on the Philippine economy in terms of output, domestic employment, international migration, household welfare, and inequality? Which sectors are the most affected? Are there any indirect effects?
4. Is FDI an instrument that could render the minimum wage non-binding and non-distortionary? How much FDI percentage increase would cause market wages to go beyond the wage floor as dictated by the minimum wage?

To answer 1. and 2., I develop a static computable general equilibrium (CGE) model featuring minimum wage and international migration and simulate a minimum wage increase on output, domestic employment, and international migration to determine whether household welfare and inequality are improved or worsened as a result of such labor market distortion.

To answer 3. and 4., I develop a dynamic CGE model by incorporating FDI, as well as domestic capital and foreign capital accumulation. I simulate an FDI increase under the minimum wage increase, aiming to determine whether FDI can neutralize the negative employment impacts of minimum wage as depicted in the static model simulation. I also simulate a larger FDI increase to demonstrate whether FDI could increase labor demand large enough for firms to offer wages higher than the subsistence level that the minimum wage presumes.

1.3. Main Findings of the Dissertation and Contributions to the Literature

In the static CGE model, the minimum wage increase would primarily promote international migration with small voluntary unemployment and would improve the welfare of all households as a result of the increased remittances. The overall welfare improvements, however, would be accompanied by some unintended effects as welfare impacts vary among households; the Gini coefficient indicates neither an improvement nor deterioration of inequality, mainly as a result of the richest household group, the NCR, still receiving the most welfare gains and the poorest household group, Mindanao, still receiving the least welfare gains. The remittance increase would lead to an appreciation of the domestic currency, which causes the Dutch disease and tax base erosion due to an increase in non-taxable remittance income and changes in industrial structure toward non-tradable sectors.

In the dynamic CGE model, a 40 percent FDI increase is needed to protect the domestic industry and discourage international migration that occurs in the static model.

The FDI increase would neutralize the migration effect after 7 to 8 periods. Similar to the static model findings, all household groups would receive positive welfare gains, but the inequality incidence is unchanged. Unexpectedly, the FDI increase would indirectly affect the agriculture sector due to a surplus of foreign capital in other sectors that would redirect excess domestic capital to the agriculture sector. Lastly, a higher threshold of FDI increase of 50–100 percent is required to mitigate the minimum wage distortions in the labor market.

I have examined the impacts of a minimum wage increase in the first study and a minimum wage increase coupled with an FDI increase in the second study. These two policy experiments suggest that policy interventions are followed by unintended outcomes, such as higher migration, tax base erosion, persistent inequality, and the incidental growth of the agriculture sector. In a macroeconomic and general equilibrium framework, I can comprehensively describe the linkages through which a policy shock works its way into the macroeconomy and examine both intended and unintended outcomes to assist policymakers in formulating policy reforms. For example, while the minimum wage is often expected to uplift the wages of the poor, cross-border migration arising from the minimum wage increase results in lower domestic production and a lower tax base. To address the unintended impacts of minimum wage, I analyze the role of FDI as the Philippine government proactively welcomes FDI inflows by amending laws and removing barriers to FDI. While FDI is often expected to promote non-agriculture sectors and thus exacerbate the inequality incidence, my experiments illustrate that FDI would indirectly promote the domestic employment of unskilled workers in the agriculture sector and would neither improve nor worsen the inequality incidence. This effect on the agriculture sector would cancel out the abovementioned effect of FDI on inequality

toward inclusive growth. Even though FDI would not improve the inequality incidence, FDI is an effective instrument in neutralizing outward migration in response to the unintended impacts of the minimum wage increase.

My contributions to the existing minimum wage and FDI literature are fourfold. (1) While the current literature has assumed the minimum wage increase in a closed economy, e.g., Card (1992), I examine the minimum wage increase in an open economy. In contrast to the lower domestic employment, implying lower income, as Card (1992) observes, I find that workers, especially unskilled ones, would migrate abroad, and migrant remittances would increase domestic labor income that would improve the welfare of all households. (2) Inflows of foreign capital or FDI, on the other hand, would also increase the welfare of all households because of its positive domestic employment effects in FDI-host sectors, especially in the manufacturing and service sectors. While many studies, such as Alderson & Nielsen (2002) and Aldaba & Quejada (2022), suggest that FDI favors the manufacturing sector, I find that FDI inflows would also benefit the agriculture sector and its unskilled workers in the Philippines indirectly. (3) Regarding the inequality incidence, contrary to the body of literature that argues the minimum wage increase would uplift the lives of the poor, my study finds that inequality would remain the same because the largest welfare gains would accrue to the rich households (i.e., households in the National Capital Region (NCR)) and also to the poor households (i.e., the households in Mindanao), which jointly make the inequality outcome neutral. The FDI increase would also neither improve nor worsen inequality as the increase would retain the households' initial order of welfare levels (i.e., the NCR followed by Luzon, Visayas, and Mindanao). The largest welfare gains from FDI would still accrue to households in the NCR, followed by Luzon, Visayas, and Mindanao. As the gaps in their

welfare gains are not sizable, the inequality incidence would not deteriorate, given the assumed FDI increase. (4) I demonstrate that by allowing labor and capital mobility (i.e., in the form of international migration and FDI) in my study, the negative implications of the minimum wage increase, such as reduced domestic employment and wages, could be mitigated by promoting FDI. Therefore, I conclude that FDI can neutralize the negative domestic employment effects of minimum wage in the Philippines.

1.4. Organization of the Dissertation

The remainder of the paper is organized as follows. I discuss the literature on minimum wage, migration, remittances, FDI, and the CGE framework in Chapter 2. Chapter 3 describes the data and methodology used in the static and dynamic CGE model. In Chapter 4, I use the minimum wage to determine its impact on output, domestic employment, international migration, household welfare, and inequality. I develop the static model in Chapter 4 into a recursive dynamic CGE model in Chapter 5 to incorporate dynamics that better illustrate the dynamic nature of FDIs. More specifically, I use the model to examine the magnitude of the FDI increase needed to inhibit international migration that would harm the domestic industry. I also investigate the impact of the FDI increase on output, welfare, and inequality among households. Chapter 6 concludes and indicates directions for the extension of this research.

While my simulation experiments can demonstrate many things, these simulation results are sometimes dependent on my assumptions about the simulation scenarios, model structure, parameter values, among others. To derive as general and robust conclusions as possible, I test a wider range of assumptions and scenarios in the model

simulations and arrange them accordingly in the appendix. I provide sensitivity analyses that cover varying magnitudes of minimum wage increase and FDI increase. While I assume that the minimum wage covers three labor market segments, there could be alternative views about its coverage; thus, I conduct an additional experiment by assuming that the minimum wage affects only unskilled workers among the four labor types. To test the robustness of my static and dynamic model simulation results, I employ different values for the Armington elasticity, constant elasticity of substitution (CES) and constant elasticity of transformation (CET). In the dynamic model sensitivity analyses, I experiment with various population growth rates and investment allocation parameters. I display some supplemental tables to describe the aggregation of the Social Accounting Matrix (SAM) and show the aggregated SAM itself, while the supplementary table on foreign capital factor intensity supports my dynamic model simulation results. Lastly, I explain the dynamic model calibration techniques in detail and fully describe the static model and dynamic model equations.

2. Review of Related Literature

2.1. Minimum Wage

The two main objectives behind minimum wage legislation are alleviating poverty and preventing firms from abusing their power in determining wages. A wage floor like the minimum wage prevents market forces from lowering the wages of least-educated and low-skilled workers too much (Chasanov, n.d.). Thus, a minimum wage stipulation ensures that workers are paid a just and equitable share of income (ILO, n.d.b).

In a perfectly-competitive market, workers receive wages equal to the value of their marginal product of labor. A mandated minimum wage that exceeds the market-clearing wage would result in either unemployment of workers whose services are worth less than the minimum wage rate or higher productivity of workers whose efforts positively respond to higher wages, as exhibited in the efficiency wage theory (ILO, n.d.c). Sotomayor (2021) observes that higher wages of working individuals are attributed to Brazil's poverty and inequality decline of 2.8 and 2.4 percent, respectively, and that this positive outcome diminishes if the minimum wage is higher relative to median wages. Unless the minimum wage increases workers' marginal productivity, the minimum wage is highly likely to result in lower domestic employment and aggregate output (Stigler, 1946).

Increasing the minimum wage reduces domestic employment, but its impact on domestic employment in developing countries is smaller than expected. For example, a minimum wage increase would reduce the domestic employment of low-productivity workers while boosting capital investment in South Korea (Seok & You, 2022), which

was just reclassified from a developing to a developed country in 2021. The impact of minimum wage on overall employment in Vietnam is small (Nguyen, 2013). In Indonesia, doubling the minimum wage causes urban employment to fall by only less than five percent (Rama, 2001). In general, the domestic employment effects of the minimum wage are small for developing countries, as concluded by Broecke et al. (2017) and Martínez & Martínez (2021) in their meta-analyses.

Similar to the case in other developing countries (Paqueo et al., 2016; Broecke et al., 2017), the Philippines also experiences lower domestic employment, especially for unskilled workers, due to a minimum wage increase (Canales, 2014; Sugiyarto & Endriga, 2008). The impacts of the increase are larger in labor-intensive firms (Lanzona, 2014) and labor-intensive sectors such as the service sector, 80 percent of which are unskilled (World Bank, 2013). The impacts also cover a wide range of workers, not only minimum wage earners but also those earning up to 50 percent more than the minimum wage (Canales, 2014). Sicat (2004) provides evidence that the minimum wage, as a kind of government intervention, has favored the welfare of currently employed workers rather than promoting total domestic employment in the Philippine economy; the unemployment rate in the Philippines reached 5.3 percent in 2018. In the case of developed countries, a minimum wage increase has been found to induce little to no impact on unemployment. Metcalf (2008) attributes this negligible impact on unemployment to workers' reduced hours at work, firms' smaller profits, and an overall increase in the price of goods and services produced by minimum-wage workers in the United Kingdom. In the U.S.A., an increase in minimum wage does not lead to unemployment but causes firms to reduce working hours, non-wage benefits, training, and turnover of workers while accepting smaller profits and lowering operating costs (Schmitt, 2015).

When I examine the impacts of minimum wage, some arguments emerge for its coverage, enforcement, and compliance because a minimum wage does not necessarily determine the wages of all workers, whose productivity can vary widely. Many empirical studies examine the case of marginal workers, whose earnings are likely to be as low as the minimum wage (e.g., Cengiz et al., 2019; Card, 1992). Card (1992) considers teenage workers as marginal workers because they are usually paid less and are at the lower end of the income distribution. Contrary to these concerns, the minimum wage adjustment can impact a wider range of workers in the U.S.A. (Lopresti & Mumford, 2016) and the Philippines (Canales, 2014). Regarding enforcement, DOLE finds that the compliance rate was 86 percent in 2018 (Philippine News Agency, 2018). Sugiyarto & Endriga (2008) confirm the binding aspect of minimum wage in the Philippines; minimum wage compliance is most evident among large firms (98 percent), followed by medium firms (85 percent) and small firms (80 percent). Thus, I assume that the Philippine labor market is not segmented (i.e., all workers in the same labor category face the same wages).

2.2. Migration and Remittances

Migration is a global phenomenon that has existed as early as mankind. According to the 2020 World Migration Report, the number of migrants worldwide is approximately 272 million, nearly two-thirds of whom are labor migrants. International migrants have increased to 3.5 percent of the global population in 2019, from 2.8 and 2.3 percent in 2000 and 1980, respectively. Temporary migration occurs when migrants leave for work but intend to return to their home country in the future. In contrast, permanent migration happens when migrants leave for permanent residency, repatriation, marriage, or refuge

abroad and have no intention to come back despite facing some difficulties such as discrimination and the lack of migrant protection overseas. According to Walmsley & Ahmed (2008), migration in Asia is temporary in nature mainly because of the goal of supplementing family income.

Promoting cross-border labor mobility brings far greater gains than liberalizing trade driven by the price differential between labor services and goods trade across countries (Asian Development Bank & The World Bank, 2018). Brunow et al. (2012) find evidence that net outward migration from developing countries and inward migration into developed countries stimulate growth for both developing and developed countries and the world in the long run. According to Walmsley & Ahmed (2008), a three percent increase in Filipino migrants in the labor force of developed economies (i.e., North America, Japan, Europe, and Oceania) would increase real GDP by 23 percent in the short run and would result in additional inward remittances of two million USD for the Philippines, while loosening labor mobility restrictions within ASEAN would enlarge investment and capital stock in the Philippines by 24 and 26 percent respectively. Thus, the largest gains (in terms of real income) are achieved when more remittances are earned through international migration activities.

Migration is a worldwide occurrence, and there are several reasons why individuals may decide to move from one place to another. Migration is caused by, first, a shortage of domestic employment opportunities (Organization of Economic Co-operation and Development (OECD) /Scalabrini Migration Center, 2017). Second, the level of domestic wages and foreign wages (Pholphirul, 2019; Tabuga, 2018) can also prompt households to migrate. Bertoli et al. (2016) and Mckenzie et al. (2014) find evidence that migration is indeed driven by foreign minimum wages, but these studies do

not consider the effects of domestic minimum wages on migration. Third, the size and growth of an economy determine its attractiveness as a migrant destination country (Beine et al., 2019). Lastly, the presence of migrant networks from the same country of origin in the destination country increases the likelihood of migration to the destination country (Docquier et al., 2014).

International migration reduces the available workforce in the domestic labor market in exchange for an increase in remittance inflows and thus impacts the macroeconomy positively and negatively. Rodriguez & Tiongson (2001) and Ang et al. (2009) observe that outward migration negatively affects domestic labor participation and the number of hours worked. Hence, migration reduces domestic labor supply and earnings in the domestic labor market but results in higher household welfare in the Philippines (Rodriguez & Tiongson, 2001). Labor-abundant countries also benefit from migration because migration allows them to reallocate labor to high-income countries and thus maximize their comparative labor advantage (Agbahey et al., 2021). With rural-urban migration, Basu (2004) determines that an exogenous wage distortion, such as the minimum wage, exacerbates unemployment but does not account for a situation with cross-border migration. Di Giovanni et al. (2015) find that some countries are better off with outward migration activity because of the remittances these migrants bring into their home country. Besides the welfare benefits for migrant household members, migration can also stimulate economic activity through remittances (Taylor, 1999), which is crucial for economic growth (Ratha et al., 2016).

Foreign economic shocks can complicate the flow of migration as well. For example, a positive GDP shock at migrant destination countries would encourage workers to migrate to these countries (Mckenzie et al., 2014). Similarly, Hossain & Hosoe (2020)

demonstrate how a foreign wage shock would prompt the return of migrants, while wages are flexibly adjusted (i.e., no wage fixity) in the domestic economy.

Remittance is an expected outcome of international migration activity and is the major direct positive impact of migration (Taylor, 1999). Migrants from abroad work and remit a portion of their incomes for their family members back home to spend. In the Philippines, remittances are primarily used to cover basic needs such as food, clothing, utilities, healthcare, and to a small extent, education and investment. It is also known that remittances are spent to finance children's schooling in the country's rural areas (Estudillo et al., 2009). As a result, remittance inflows uplift the lives of poor Filipino households and improve their quality of life (Gorodzeisky & Semyonov, 2014). Remittances are expected to boost aggregate domestic demand and production by increasing the consumption and investment of recipient families with accompanying multiplier effects. The additional increase in income levels and demand thus promotes domestic production and job creation that also benefits non-recipient households as well (Ang et al., 2009).

While remittances can improve the livelihood of households, they can also have unintended effects on the macroeconomy. At the aggregate level, Serriño (2012) finds a positive impact on GDP in the long run but a negative impact of remittances on output in the short run, because the long-run effects portray productive investments made in education and business using remittances, while the short-run effects possibly capture the income effects of migrant households' reduced domestic labor market participation due to higher remittance income. Large remittance inflows promote currency appreciation and harm particularly tradable sectors, a.k.a. the Dutch disease phenomenon (Lartey et al., 2012; Tuaño-Amador et al., 2007). The appreciation of the domestic currency may

undermine export competitiveness, making export goods expensive (Bayangos & Jansen, 2011). Because of remittances, the economy hosts households that consume more and participate less in domestic labor markets and production processes (Adams, 2011; Basnet et al., 2019; Chami et al., 2008). Similarly, Bayangos & Jansen (2011) use a New Keynesian model and predict that a remittance increase would hit the economy not only by triggering an appreciation but also by initiating a labor supply reduction and migration, where the latter is assumed to be an exogenous shock. The impacts of remittances on households are not necessarily equal for all households. Ohira & Firshan (2022) find that rich households more frequently receive remittances than poor households. Remittances received by rich households exacerbate the inequality incidence (Rodriguez, 1998). On the contrary, Azizi (2021) finds that a 10 percent increase in per capita remittances in developing countries improves the inequality incidence based on a 0.3 percent decline in the Gini coefficient. Thus, the literature on remittances and inequality is inconclusive, even when I limit the literature to the context of the Philippines.

On the fiscal side, the literature on taxation on remittances focuses on brain drain – skilled professionals in developing countries seek better opportunities abroad and deter the development of their home countries. Bhagwati (1976) proposes a tax on the earnings of skilled workers from developing countries who migrate to developed countries, which can compensate for the fiscal losses due to foregone tax revenues (Mohapatra et al., 2012). Unskilled labor migration, however, is more important than skilled labor migration because unskilled workers dominate international migration; 87 percent of migrants in the ASEAN and 73 percent of migrants globally are unskilled workers. Moreover, the proportion of unskilled migrants is notably larger in countries with lower per capita

income (Orbeta, 2013).³ In the Philippines, unskilled migrants send 27 percent of total remittances, the largest share among all occupation groups (PSA, 2020b).⁴ Remittance plays a huge role in expanding the income of households, but it does not necessarily increase government tax revenues because cross-border remittance is not taxable in the Philippines. Thus, a shift from domestic labor to remittance income erodes a major tax base. While remittances can provide fiscal space (Chami et al., 2008; Ebeke, 2008), the abovementioned shift in industrial structure toward non-tradable sectors dominated by informal sectors and thus less taxable could split another major tax base on industries. Studies on migration driven by differences in personal income tax rates usually focus on high-income earners in developed countries (Kleven et al., 2020). Thus, studies have yet to be found regarding the effects of migration on tax revenues in the context of the Philippines.

Imposing taxes on migrant remittance incomes seems appealing to the government due to the large amount of remittance inflows. However, it is not likely to work as intended, or it could even be regressive (Mohapatra et al., 2012). In 1997, the Philippine government imposed taxes on all migrant earnings abroad, not only on the share of remittances remitted back home (Brown, 2006). Pomp (1989) discusses the complexity of taxing non-resident Filipinos mainly because of administrative difficulties, double taxation, and exchange rates. Taxing non-resident Filipinos is not economically feasible because of costs and physical boundaries although remittances can be indirectly

³ For example, 43 percent of Filipino migrants in 2021 were engaged in elementary occupations, while nine percent of migrants were involved in professional work (PSA, 2022).

⁴ By contrast, only 12 percent of total remittances are sent by professional migrants.

taxed through value-added taxes if spent on household consumption (Asatryan et al., 2017). Since remittances are usually sent to migrants' poor families, the government would anticipate political difficulties and often choose weak or implicit ways to tax migrant remittances. Cuba obliged their migrants to convert their remittances at an overvalued exchange rate, while India and the Philippines formerly charged a small stamp fee on incoming remittances (Mohapatra et al., 2012). Chami et al. (2008) propose lower taxes on remittances by migrant-sending countries that would encourage remittances and facilitate the development of emerging countries (Ziesemer, 2012). To prevent tax evasion, governments have tried to capture remittance flows with the domestic banking system but failed in the Philippines, Pakistan, Thailand, and Bangladesh (Lindsay & De La Garza, 2000; Puri & Ritzema, 1999), except in South Korea (Brown, 2006). When remittance taxes were removed, the flow of remittances returned to formal channels (Olimova & Bosc, 2003; World Bank, 2006). The Bangladeshi government even provides cash incentives if remittances are sent through official channels (Bangladesh Ministry of Foreign Affairs, 2022), while the Pakistani government allows any amount not exceeding 10 million PKR remitted using normal banking channels to be excluded from taxable income (Pakistan Remittance Initiative, n.d.). Recent developments in financial technology provide more options of transferring money internationally and avoiding taxation.

2.3. Foreign Direct Investments

Cross-border movement of foreign capital or FDI enables host economies to engage in productive economic activities that would not be possible with domestic

investments or savings alone (OECD, 1999). Capital mobility across borders allows capital to seek better returns for investment purposes (Lougani & Razin, 2001). Given foreign capital mobility, global FDI is expected to be reallocated particularly to developing economies whose comparative advantage is the abundance of cheap and unskilled labor (Ernst, 2005; Nunnenkamp et al., 2007). Thus, FDI is expected to create more jobs for unskilled workers, especially in developing countries such as the Philippines.

Given its increasing importance in the globalized world, FDI has been studied extensively in the literature. According to Blonigen (2005), FDI is driven by many factors, including institutional characteristics, namely corruption, infrastructure, telecommunication, and internet access, among others. In FDI activities, the tax treatment in FDI host and parent countries would determine the amount of taxes to be incurred. Another factor is foreign currency exchange rate appreciation which would lead to the increased wealth of foreign firms, making it cheaper for them to invest in domestic firms from abroad. Lastly, a higher level of foreign demand for export goods would naturally progress to business expansion and FDI as exports and FDI are usually regarded as substitutes (Blonigen, 2005). In the Philippines, determinants of FDI include trade policies, infrastructure investment, real GDP, and real effective exchange rates (Mercado-Aldaba, 1994) that are associated with the investment climate, economic competitiveness, and growth prospects of a country.

FDI promotes economic growth in 29 less-developed countries (Sylwester, 2005) and 23 Asian countries (Tiwari & Mutascu, 2011). Bende-Nabende et al. (2003) find a negative long-run relationship between FDI and output for developed countries like Japan and Taiwan but a positive long-run relationship for the Philippines. Similarly, Agbola

(2014) determines higher economic growth for the Philippines, but sustaining it requires better infrastructure and increased human capital. Economic growth occurs mainly because FDI adds to the current capital stock and raises productivity that is captured by other domestic factors of production (Brooks et al., 2008). FDI also generates technological spillover (OECD, 2002) and productivity spillover effects between domestic and foreign firms (Aldaba & Aldaba, 2010). Thus, higher FDI increases domestic employment and income, which encourages workers to return from abroad (Bui et al., 2019). Borensztein et al. (1998) assert that FDI contributes more to growth than domestic investment as long as there is sufficient human capital in the host country. In Nigeria, a 100 percent increase in FDI leads to a 44 percent increase in output (Ayanwale & Bamire, 2004), while in China, Zhou & Latorre (2014) implement a 100 percent increase in capital stock specifically in the electronics sector and find a 3.8 percent rise in national income. In general, the existing literature agrees with the notion that FDI is beneficial to the host country (Brooks et al., 2008).

Most empirical studies find positive impacts of FDI on household welfare (Bui et al., 2019; Zélity, 2022). Theoretically, FDI may increase domestic productivity and create technological spillovers that may push wages up, pull prices down and generate more output that give rise to higher household welfare (Zélity, 2022; Zhou & Latorre, 2014). Similarly, Petri (1997) observe positive welfare changes where FDI liberalization occurs. Thus, studies have found different ways to liberalize FDI following treaties and international agreements. The work of Petri (1997) is a pioneer in integrating FDI in the CGE modeling framework, where, as a method of FDI liberalization in line with the Bogor Declaration, they cut taxes on FDI profits and eliminate tariffs in Asia-Pacific Economic Cooperation (APEC) regions. As a result, the rest of the world loses investment

to APEC regions. Jensen et al. (2007) simulate the liberalization of FDI barriers in Russia in its accession to the World Trade Organization. The mechanisms by which they lower FDI barriers using a CGE model are by decreasing tariff rates by 50 percent, increasing export prices to signify improved market access, and reducing discriminatory tax on multinational enterprises (MNEs) in the service sector. They underscore the importance of the service sector because the liberalization of FDI barriers against MNEs in service sectors would derive the largest gains for the Russian economy. Zhou & Latorre (2014) warns that barriers to entry of FDI are not readily observable; it may be more suitable to exogenize FDI rather than endogenize it by estimating proxies that can explain it.

Unlike previous CGE models that lower FDI barriers in simulation experiments, Latorre et al. (2009) simulate an increase in capital stock, similar to my approach in Chapter 5, because an accurate assessment of FDI barriers is difficult and may introduce unpredictable biases in the analysis. They distinguish firms into domestic and MNEs to underscore the presence of MNEs in the Czech Republic and find a small increase in GDP, welfare, and wages of the host country. By contrast, Bchir et al. (2002) exhibit FDI as cross-border capital flows where all firms are homogenous (i.e., no MNEs) and no technological gap exists between domestic firms and MNEs. They also find that FDI flows increase GDP, welfare, and wages for both skilled and unskilled workers in the European Union (EU). However, they only indicate better welfare to the EU as a whole and provide no information regarding the distributional impacts on household groups, which is important in assessing household welfare. Chaudhuri & Banerjee (2010) discover that FDI unambiguously improves social welfare if channeled through the agriculture sector as it results in higher wages for many unskilled workers comprising the sector.

While increasing foreign capital inflows can improve household welfare, as most studies have shown, the sudden liquidity surge may also trigger unintended outcomes. FDI exacerbates inequality by creating high-income groups (Lee, 2006) and thriving in a particular sector or region (Song et al., 2021). FDI is also linked to higher real wages (Aitken et al., 1996; Fatima & Khan, 2018) and can generate relatively higher demand for high-skilled workers, causing a wage differential between high-skilled and low-skilled workers (Feenstra & Hanson, 1997). According to Cruz et al. (2018), FDI in the Philippines would increase skilled and unskilled wages by 5 and 12 percent, respectively; FDI would increase the relative demand for unskilled labor, especially in developing countries with comparative advantage in unskilled labor employment. They also find that FDI is associated with higher unskilled labor employment and wages in six developing countries because of a reduction in skill premium (i.e., the ratio of skilled to unskilled wages). These findings on the adverse effects of FDI on inequality, however, are not necessarily robust because Sylwester (2005), Franco & Gerussi (2013), and Kábrt & Bruna (2022) do not find any relationship between FDI and inequality. Thus, I need to identify the gains and losses caused by FDI by scrutinizing how job creation by FDI would impact household welfare, enhance output and achieve economic growth, using a structural model like a CGE model.

2.4. CGE Model Framework and Applications

CGE models are built upon the theory of general equilibrium by Arrow & Debreu (1954), where demand, supply, and prices in a macroeconomy adjust until they achieve a point of equilibrium. The demand and supply functions are derived from agents'

optimization behavior. Its feature as a structural model enables me to examine agents' reactions to policy shocks in my assessment. While explaining the details of the model framework, I highlight the major features of CGE models and their applications to the related policy issues.

CGE models can offer insights on the benefits, costs, and broad impacts of economic policies and at the same time, reveal indirect or unexpected outcomes. As CGE models consider the interdependence between sectors, agents, and markets, they can represent the entire economy in equilibrium. Models are often calibrated to observed one-shot data without policy shocks; the estimated structural model allows me to simulate counterfactual experiments with policy shocks. In contrast to partial equilibrium models that focus only on one market in the economy, CGE models can capture interactions among different markets. While input-output (IO) models look like CGE models in this sense, IO models assume no capacity constraints. In addition, CGE models focus on long-term impacts in a real economy instead of dynamic stochastic general equilibrium (DSGE) models that mainly examine business cycle uncertainties and short-term fluctuations in a monetary economy.

The CGE model, however, has limitations. It may not be suitable for forecasting and predicting outcomes, especially in trade (Kehoe et al., 2015; Shikher, 2012) because it may not account for the growth of newly traded goods or goods in extensive margins if these goods have no trade history in the base year (Kehoe et al., 2015). The model returns solutions based on assumptions and relies on underlying general equilibrium theory using equations to create a benchmark model. The model is calibrated on key assumptions, such as the choice of functional forms for production and utility functions. For these functions, I often employ a constant elasticity of substitution (CES) that is

well-known to be a crucial parameter in CGE models. The Armington's (1969) elasticity of substitution, which characterizes substitutability between domestic and imported goods, is often plugged in by assumption, based on earlier studies or based on a standard database, such as the Global Trade Analysis Project (GTAP) database. Simulation results can be affected by the construction of macro closure and the choice of endogenous and exogenous variables (Robinson, 1988), as well as the author's choice of a numeraire if models lose zero-homogeneity in prices (Hosoe, 2000). The numeraire price is particularly important in analyses of wage fixity but is often overlooked. Thus, in interpreting results later on, I need to fully consider these assumptions.

The first acknowledged work in CGE modeling was that of Johansen (1960), when he constructed a multi-sectoral CGE model for Norway using Leontief's IO mechanism (Leontief, 1936). In his work, agent activities and price adjustments in output and factor markets influence the equilibrium outcome for the economy (Dixon & Rimmer, 2016). To date, Johansen (1960) has made an unparalleled contribution to the evolution of CGE models. CGE models have been constructed and used to analyze single and multiple economies. They can be applied to various topics such as fiscal reforms, trade liberalization, transportation, energy, disaster analysis, environmental issues, and climate change. In the case of the Philippines, the prominent use of CGE models was in tariffs (Cockburn et al., 2008; Go, 1994), trade (Cororaton & Cockburn, 2007), taxation (Boyd et al., 1994; Clarete & Diokno, 2000), agriculture (Briones, 2013; Cororaton, 2004), energy (Cabalu et al., 2015), and disaster (Tuaño et al., 2018). Most CGE studies in the Philippines have been conducted to determine how policy changes and reforms impact the poor Filipino households. However, the literature on the implications of these policy reforms to the poor in a general equilibrium framework is still lacking. Even though

important economic elements such as labor migration and FDI can positively affect poor households through remittances and job creation, there are still no existing CGE or related studies that underscore the important role of international factor mobility in the country.

The structure of CGE models largely depends on the assumption of factor mobility. In most studies, goods and services are traded across borders, while primary factors, such as labor and capital, remain within borders. Factor mobility is usually not assumed in the short run because factor movement across industrial sectors takes time (Shahraki & Bachmann, 2018). However, they are to be assumed internationally mobile because of the scope of my study; I aim to capture long-run impacts in a model with migration and FDI.

Both international labor and capital mobility have been manifesting in growing Asian economies in the form of migration and FDI due to the increasing need to maximize the limited use of factor endowments for development. One strand of the literature focuses on labor mobility (Agbahey et al., 2020; Pouliakas et al., 2014). Pouliakas et al. (2014) identify and simulate migration flows by employing changes in the overall labor supply and skilled/unskilled labor supply and find that labor mobility in European regions positively impacts GDP and welfare while confirming brain drain as a hindrance to economic development in general. Agbahey et al. (2020) discover that increased demand for labor and higher wages in destination countries would encourage migration of domestic workers, which would decrease the domestic labor supply and increase domestic wages. While migrant remittances would increase household income, the large inflow of foreign currency would appreciate the domestic currency (a.k.a. the Dutch Disease phenomenon) and lead to losses in export production.

The other stand focuses on capital mobility. Jensen et al. (2007) model limitations on FDI as taxes (i.e., tariffs and export taxes) and find that FDI liberalization in Russia's service sector brings five percent more consumption gains. By contrast, Latorre et al. (2009) consider FDI as a type of greenfield investment where increasing FDI is equivalent to increasing capital inflow instead of increasing foreign ownership through mergers and acquisitions. To support the existing literature on FDI and multinational firms, Fukui & Lakatos (2012) produce a new dataset on foreign affiliate sales to observe the operations of multinational firms. However, the literature covering both labor and capital mobility and their interaction is limited. To highlight the increasing importance of labor and capital movements in the globalized world, I need both labor and capital mobility in the model to study the long-term interaction among minimum wage, FDI, and migration. To address this issue, Hossain & Hosoe (2020) and Jafari & Britz (2020) study CGE models with extensions in both labor and capital mobility for the Bangladesh and U.K. economy, respectively. Hossain & Hosoe (2020) simulate an increase in FDI stock in the ready-made-garments (RMG) sector in Bangladesh, while Jafari & Britz (2020) employ a reduction in foreign savings to represent lower FDI because foreign savings are the main source of FDI in the U.K.

2.5. Conclusion

The studies summarized above mainly examine either minimum wage, remittances, endogenous migration decisions, the Dutch disease phenomenon, or FDI effects on industries and households. Studies on minimum wage, migration, and FDI primarily use econometric techniques rather than extensive or large-scale macroeconomic

models. Although minimum wage, migration, and FDI are major features of labor and capital markets in the Philippines, their roles and linkages with other macro- and microeconomic variables have yet to be studied comprehensively in a general equilibrium framework. In designing new minimum wage regulations, assessing its impacts on labor markets and the macroeconomy is appropriate. Numerous studies overlook the prevalence of migration and thus need to be more comprehensive to provide good predictions about what could be achieved and lost by implementing the policy. Attracting FDI often appears at the top of policy agendas in many legislations, but its impacts have rarely been predicted quantitatively.

That gap in the literature could be filled using a structural macroeconomic model that can elucidate the pivotal role of migration and FDI in the economy, e.g., the structuralist CGE model featuring unemployment and wage rigidity that is used by Taylor (1990). However, this model does not consider migration; thus, I extend my model by incorporating a migration option for workers, à la Hossain & Hosoe (2020). I develop the static CGE model into a recursive dynamic CGE model to integrate FDI and determine its effects on output, domestic employment, international migration, household welfare, and inequality. I present these two models in Chapter 3 to better understand the models' features and extensions and analyze the simulation results of minimum wage and FDI increases in Chapters 4 and 5.

3. Methodology and Data

3.1. Basic Features of the Static CGE model and Extensions

I develop a static CGE model based on the standard CGE model of Hosoe et al. (2010) to simulate a domestic minimum wage increase in a general equilibrium setup and examine the impacts of that increase on domestic production, migration, welfare, and inequality among the four types of households (i.e., the NCR, Luzon, Visayas, and Mindanao). My models distinguish nine sectors and six factors of production (Table 3.1). The production process, featuring constant returns-to-scale production technology, starts from the bottom of Figure 3.1. A composite factor is formed by employing six primary factors through a Cobb-Douglas (CD) production function. The external sector captures the returns on foreign capital. Combining intermediate inputs with the composite factor, producers generate the domestic output using a Leontief production function. A CET function converts the domestic output into domestic goods or exports, while a CES function generates the Armington composite good from domestic goods and imports. Armington composite goods are used for household consumption, government consumption, investment, and intermediate input production; the Armington elasticities of substitution are adopted from the GTAP database (version 10A) (Aguiar et al., 2019;

Hertel, 1997).⁵ Composite consumption consists of various consumption goods with a CD aggregation function.

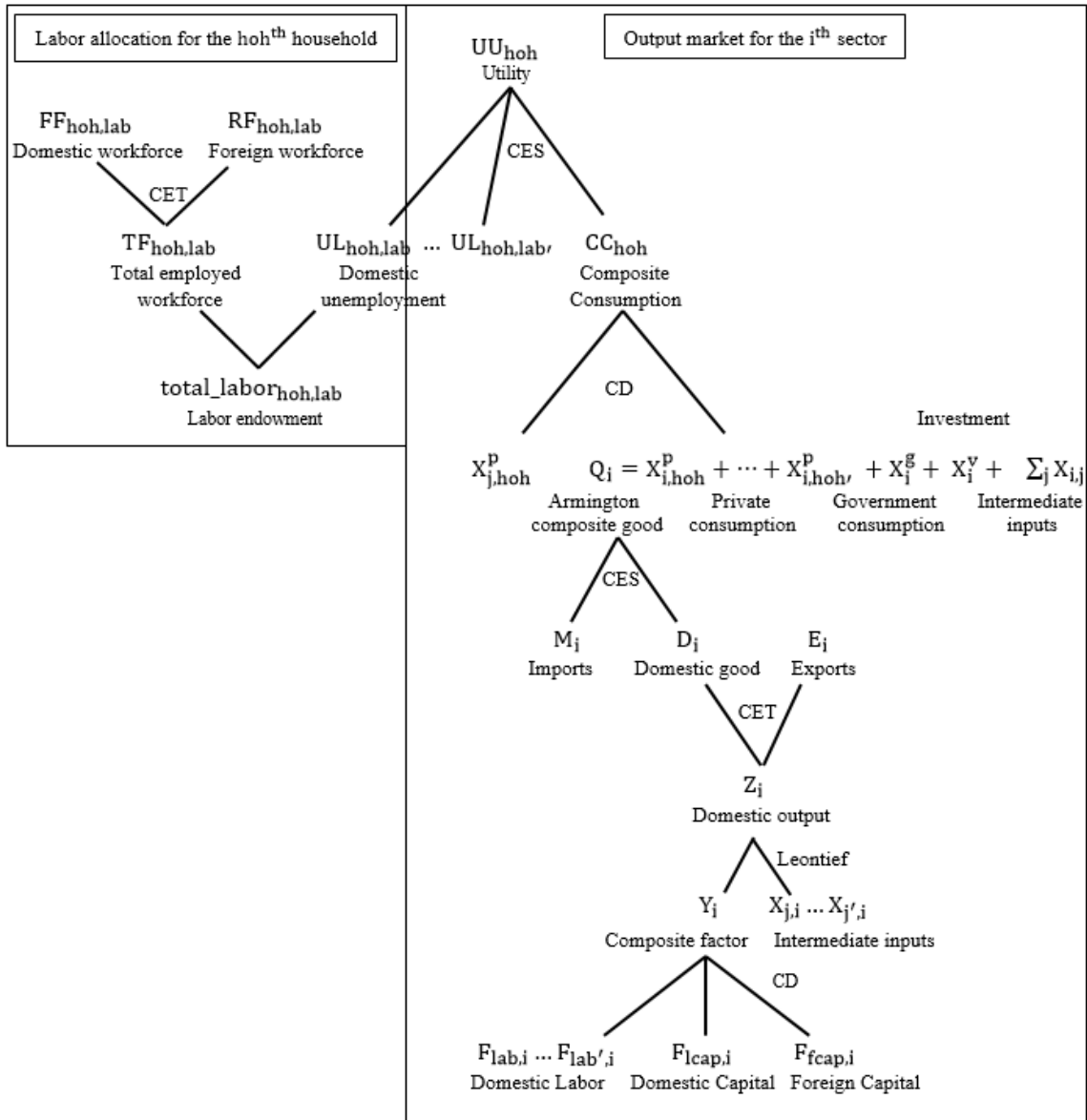
Table 3.1. Sectoral and Factor Aggregation.

Sector	Factor
Agriculture	Labor
Other Primary	Professional
Food and Beverages	Technical
Manufacturing	Clerical
Petroleum	Unskilled
Service	Capital
Wholesale and Retail Trade	Domestic
Transportation	Foreign
Finance	

Source: Author's Aggregation.

⁵ To check for the robustness of my simulation results, I conduct sensitivity analyses concerning critical parameters assumed in the model, i.e., elasticity in CES/CET functions. The results indicate no qualitative differences in my conclusion. Details are provided in the Appendix Section A.1.2 and A.1.3.

Figure 3.1. Structure of the CGE Model for the i^{th} Sector/ the hoh^{th} Household.



Household utility depends on the composite consumption of goods and services, as well as consumption of leisure $UL_{\text{hoh,lab}}$, which is equivalent to being voluntarily domestically unemployed in Figure 3.1. Total labor endowment $total_labor_{\text{hoh,lab}}$ is allocated between leisure and the employed workforce $TF_{\text{hoh,lab}}$ (left panel of Figure 3.1). Households are categorized into four groups, (i.e., the NCR, Luzon, Visayas, and Mindanao). They earn income from wages of the four types of domestic labor, domestic

capital, and foreign labor in the form of remittances. Household income, except that from remittances, is subject to a direct tax determined by a constant tax rate; their savings are determined by a constant propensity to save. The government generates revenue from an ad valorem production tax and a direct tax on household income from domestic wages and domestic capital income. The revenue from these two taxes is allocated to government savings with a constant propensity to save and to government consumption, which is distributed among goods proportionately. The investment account allocates total savings from the four household groups. Government consumption of the i^{th} good is determined in proportion to tax revenues less government savings as if the government has a CD utility function.

I employ a small-country assumption; international prices, including migrants' wage rates, are given for this economy in USD. For the macro closure, foreign savings (or current account deficits) are also fixed in USD, while the exchange rate is flexibly adjusted.

I extend the standard CGE model in the following three parts. *First*, households are assumed to endogenously determine the supply of four types of labor as the residual labor endowment not consumed for leisure (left panel of Figure 3.1). I assume a CES function for the household utility function dependent on composite consumption and leisure consumption, with an elasticity of substitution value of 0.25, following McNelis et al. (2009).

Markets are perfectly competitive and geographically integrated within the economy. Thus, even though the four household groups are named by region in this study, I do not consider their geographical locations or their location-based activities; instead, I use them to demonstrate how policies affect the disparity between the rich and poor

households, the former and latter of which are often observed in the capital region, the NCR, and the most remote region, Mindanao, respectively.

Second, I consider a migration option for workers because the minimum wage increase is usually associated with lower domestic employment, as stated in Chapter 1. Because of the minimum wage increase, wages of jobless workers would drop to zero, while foreign wages would become relatively higher, encouraging these workers to migrate. The total employed workforce is allocated between the domestic and foreign labor markets by means of a CET function considering relative wages between these two markets. This assumption of *imperfect* transformation between domestic and foreign labor markets represents friction in mobility. This friction comprises various factors, such as moving costs, living expenses abroad, international money transfer fees, and preference of residence countries. The extent of cross-border workforce mobility is represented by the elasticity of transformation in the CET function. When such frictions are large, the elasticity becomes small. I assume an elasticity of six, based on the estimate by Bertoli et al. (2016). This large but far-from-infinite elasticity reflects mobility frictions for Filipino migrant workers. Once the workers migrate out, they are fully employed by the external sector at given wage rates in USD under the small-country assumption.

Third, the government is assumed to set minimum wage rates for all but professional labor presuming that Filipino professional wages are well above the minimum wage and that non-professional wages are close to the minimum wage as indicated by the minimum wage coverage as discussed in Section 2.1. While demand prices of the three types of workers are fixed by the government, their supply prices along with other factor prices are flexibly adjusted for factor market equilibrium. Factor

endowments are assumed given and mobile across sectors in the static model, while capital is to be assumed sector-specific and putty-clay type in the dynamic model (discussed later in Section 3.2.1).

While the choice of a numeraire does not affect the solutions of a standard Walrasian general equilibrium model, it is not the case in my structuralist CGE model with wage fixity (Hosoe, 2000). For the numeraire price, I choose the CPI, which is used as a major reference indicator in determining the minimum wage. All prices are expressed as prices relative to this chosen numeraire price.

The model is calibrated to the SAM, constructed using the 2012 IO table (PSA, 2017). The original 65 sectors in the 2012 IO table are aggregated into nine sectors (Table 3.1). Compensation of employees in the IO table is considered payments for labor use, while consumption (or depreciation) of fixed capital and operating surplus are aggregated as payments for capital usage. Taxes less subsidies on production are added into indirect taxes. Because the IO table shows no remittance inflows and reports only one aggregate household, labor, and capital, the SAM is elaborated with additional data so that I can analyze the distributional effects of international factor mobility among households. I distinguish four household groups, four types of labor, and two types of capital with additional data from the Family Income and Expenditure Survey (FIES) and Survey of Overseas Filipinos (SOF) to split households into four groups (i.e., the NCR, Luzon, Visayas, and Mindanao) and labor into four types (Table 3.1). Capital is also split into domestic and foreign capital by using the foreign capital ownership data of publicly-listed firms in the Philippine Stock Exchange (PSE). Specifically, I sort these firms according to their industry, and in this industry sub-group, I divide the total company-owned foreign shares by total outstanding shares to represent foreign ownership for that specific sector.

Based on the foreign ownership percentage, I determine the amount of foreign capital in the total capital account. It is to be noted that the PSE-listed firms in the agriculture sector do not obtain any foreign capital in the SAM (Appendix Table A. 16). The remittance data in the SAM are obtained from the total remittance value reported in the balance of payments (BOP) account of the BSP. I split the total remittance value in proportion to the professional, technical, clerical, and unskilled migrant remittance incomes as reported in the SOF. By being calibrated to the SAM, the static model replicates the base year data in the SAM; the dynamic model generates the balanced growth business-as-usual (BG-BAU) path, which is used as a reference path in my comparative dynamics.

3.2. Dynamic Model

3.2.1. Main Features and Assumptions

Impact analysis of investment, including FDI, needs an intertemporal perspective, with which the static model is not equipped. I develop a recursive dynamic general equilibrium model that integrates FDI into the previous static model with minimum wage and migration. While a forward-looking dynamic model à la Ramsey (1928) describes agents' intertemporal optimization often in a single aggregated sector setup, I use the recursive dynamic model for model simplicity and examine how the assumed shocks would affect the economy in the multi-sectoral setup. The recursive model is a sequence of static models that are solved period by period, while updating state variables (e.g., labor endowments and capital stocks) as well as exogenous variables (e.g., government consumption, FDI, and current account deficits) every period.

The major feature of the dynamic CGE model that identifies it from the static model is the investment and capital accumulation process between periods. There are two types of capital, domestic and foreign, and they are given at the beginning of a period. Investment goods installed in a sector are combined with existing capital stocks with depreciation to formulate capital stocks for the next period. Once installed in a sector, capital cannot be reallocated to other sectors but sluggishly adjusted only by investment and depreciation. That is, it is a putty-clay type of capital. Domestic capital accumulation (i.e., investment) is financed by household savings with borrowings from the rest of the world (i.e., current account deficits); foreign capital is accumulated by FDI. Endowments for the four types of labor are given by an assumed population growth rate. Calibrating the model to the SAM with some dynamic parameters such as a population growth rate, a depreciation rate, and a rate of return (discussed later in the next section), I generate a BG-BAU path where all variables grow at the rate of population growth, to use it as the reference of my comparative dynamics. I explain how these parameters drive the dynamics in detail in the next subsection.

In the static model analysis, the minimum wage condition is always binding, i.e., the market wage rates are lower than the minimum wage rates. If not, my analysis does not make sense. Therefore, I am allowed to exogenously manipulate the market wage rates to simulate changes in the predetermined minimum wage rates. However, in the dynamic model, economic growth can increase labor demand large enough to make the market wage rates higher than the minimum wage rates, which makes the minimum wage condition non-binding. To accommodate both binding and non-binding cases, I formulate the minimum wage condition with complementary slack conditions.

While the static model assumes that direct taxes are determined by taxable household income and a tax rate, the dynamic model assumes a lump-sum direct tax that allocates fiscal gaps among households with a constant allocation share. As explained in the next subsection, I assume this to make the model generate the BG-BAU path under a multiple-household setup, in which I explicitly describe the ownership of (putty-clay type) capital stocks installed in each sector, whose rates of returns can vary among sectors.

3.2.2. Assumed Dynamics and Balanced Growth Path

Dynamic CGE models allow me to track the dynamic response of key variables to economic shocks such as a minimum wage or FDI increase. Thus, these models rely on exogenous parameters to characterize dynamics such as a rate of return ror , a population growth rate pop , and a depreciation rate dep . The sources of the adopted exogenous parameters in the dynamic model are as follows. The real rate of return ror is 21 percent, which is the difference between the nominal rate of return of 23.5 percent by the Global Financial Development Database of the World Bank and the inflation rate of three percent as reported by the PSA (n.d.b). Based on censuses between 2010 and 2015, the projected population growth rate pop , is 1.72 percent (PSA, 2016). The four percent depreciation rate dep for the Philippine economy is taken from the study of Majuca (2014).

The core of dynamics in recursive dynamic models is also described by capital accumulation to link the current period static model with the next period. Capital accumulation for domestic and foreign capital is defined as follows:

$$KK_{j,t+1} = IId_{j,t} + (1 - dep) * KK_{j,t}$$

$$FK_{j,t+1} = Iif_{j,t} + (1 - \text{dep}) * FK_{j,t}$$

where $KK_{j,t+1}$ denotes domestic capital stock at time $t+1$, and $FK_{j,t+1}$ denotes foreign capital stock at time $t+1$. The base year domestic and foreign capital stocks $KK_{j,1}$ and $FK_{j,1}$ can be estimated with an assumed rate of return ror as follows:

$$F_{lcap,j,1} = \text{ror} * KK_{j,1}$$

$$F_{fcap,j,1} = \text{ror} * FK_{j,1}$$

where $F_{lcap,j}$ and $F_{fcap,j}$ denote domestic capital and foreign capital service and are observed in the SAM. To generate a BG-BAU path with a desired population growth rate pop , investments in the first period $Iid_{j,1}$ and $Iif_{j,1}$ need to be accumulated large enough to replicate the BG-BAU path, but they may not necessarily match the amount of investment reported in the SAM. Thus, I need to adjust investment data in the SAM (Hosoe et al., 2016; Rutherford, 2004) using the following:

$$Iid_{j,1} = \frac{\text{pop} + \text{dep}}{\text{ror}} * F_{lcap,j,1}$$

$$Iif_{j,1} = \frac{\text{pop} + \text{dep}}{\text{ror}} * F_{fcap,j,1}$$

The gaps between the original investment data in the SAM and the newly-computed investment data to achieve balanced growth are absorbed by adjusting government consumption, which is to be assumed exogenous in my simulations.

Households are endowed (only domestic) capital stocks $lcapshare_{hoh,j,0} * FF_{lcap,0}$ where $lcapshare_{hoh,j,0}$ and $FF_{lcap,0}$ denote the share of domestic capital installed in the j^{th} sector held by the hoh^{th} household and domestic capital endowment, respectively. Households also save with S_{hoh}^P and borrow from abroad. Incidentally, I assume that the government does not save to simplify the model. In the BG-BAU path,

capital stock installed in the j^{th} sector held by the hoh^{th} household $F_{\text{Icap},j,t}$ also needs to grow at the desired population growth rate; however, household savings observed in the SAM are likely to be larger or smaller than the amount required for balanced growth. Therefore, I need to again adjust the savings data in the SAM among the four household groups. While total savings are adjusted to match the investment in the aforementioned step, the adjustments in savings are made only among households. The gap made by these adjustments is absorbed by adjusting direct tax payments among households.

After constructing the SAM and ensuring its row-sums and column-sums are equal and balanced using the RAS method, I incorporate it into the static and dynamic CGE model. I compare the static model simulation results of counterfactual scenarios to the baseline values as depicted by the SAM since I aim to examine the changes arising from the minimum wage increase on key variables in a single period.

Using a dynamic model, I create the BG-BAU path with a constant population growth rate and compare the BG-BAU path with the path generated in the counterfactual scenario with minimum wage and FDI increase. In other words, the BG-BAU path is used as a reference point for my dynamic model simulations. The objective is to determine the impact of both exogenous minimum wage and FDI increase on the macroeconomy by looking at the changes between the simulated values and the baseline values driven by the BG-BAU path, which is also how much the endogenous variables are expected to grow over time in the dynamic model given the population growth rate.

4. Minimum Wage Study

4.1. Introduction

The Minimum Wage Law was first implemented in the Philippines in 1951. In setting the minimum wage, the Regional Tripartite Wage Productivity Board (RTWPB) refers to the poverty threshold, prevailing average wage, socioeconomic indicators such as the consumer price index (CPI), inflation, employment, gross domestic product, among others, to guarantee a fair and reasonable standard of living for Filipinos (DOLE, n.d.).

The government revises the minimum wage every one to three years mainly to protect workers from low compensation and improve welfare. While the minimum wage is determined by considering several factors and socioeconomic indicators, it is a policy tool that the government can directly control without incurring additional fiscal costs. Increasing the minimum wage is intended to increase the wages of low-income workers to improve household welfare and inequality. However, the standard economic theory predicts that a minimum wage increase would also result in currency appreciation (a.k.a. the Dutch disease phenomenon), and higher labor costs for firms and thus would lead to a decrease in domestic employment. When workers lose their jobs, they are faced with two choices; they can either enjoy leisure time (by being voluntarily unemployed) or move abroad. As mentioned in Chapter 1, workers who migrate would send home remittances, which may affect household welfare and inequality.

The inequality incidence is typically observed between rural and urban households in the Philippines. Their incomes differ not only in levels but also by income sources (Table 4.1). The NCR hosts major companies and their headquarters and thrives

on professional labor income, while Mindanao, the most rural and remote region, depends more on wages earned by unskilled labor and attains only half of the per capita income that the NCR does. Income composition is similar for Luzon and Visayas, both of which are located geographically between the NCR and Mindanao. Remittances constitute a sizable share, comparable to non-professional labor incomes of all household types; migration and remittances can influence these households significantly and unevenly, as stated in the literature. The remittance impact would be intensified as migration is boosted by lower domestic employment caused by the minimum wage increase.

Table 4.1. Household per Capita Labor Income, Capital Income, and Remittance Receipts in 2012 [Unit: Thousand PHP and as Percentage of Household Income in Parentheses].

Household	Labor Income				Capital Income	Remittance	Total
	Professional	Technical	Clerical	Unskilled			
NCR	29 (20)	15 (10)	16 (11)	7 (5)	70 (47)	12 (8)	148 (100)
Luzon	12 (12)	8 (7)	6 (6)	10 (10)	54 (54)	12 (11)	101 (100)
Visayas	10 (11)	6 (7)	5 (5)	9 (10)	53 (58)	9 (10)	91 (100)
Mindanao	11 (13)	7 (7)	5 (6)	11 (14)	42 (53)	5 (6)	79 (100)
Total	61 (15)	34 (8)	31 (7)	37 (9)	219 (52)	36 (9)	

Source: Author's Calculations using the 2012 Philippine SAM and Population Census.

Note: Some values are not exactly equal to the total due to rounding errors.

In this chapter, I aim to examine the impacts of the domestic minimum wage increase on output, domestic employment, international migration, household welfare, and inequality in the Philippines. My CGE model is extended from the standard CGE model of Hosoe et al. (2010) by incorporating endogenous migration decisions à la Hossain & Hosoe (2020), which allows me to track how the minimum wage increase would boost migration endogenously. I demonstrate that higher wage rates caused by the minimum wage increase would reduce domestic jobs but encourage workers who lose jobs to migrate for almost comparable wages offered abroad and send remittances back home. I further investigate possible unintended consequences of the minimum wage increase, particularly in macroeconomic and fiscal aspects, and conclude this chapter with policy implications.

4.2. Simulation Scenarios

Historically, minimum wage rates have been raised by only one percent per annum in real terms between 2011 and 2018 (Figure 1.1). In my simulation, I assume a more aggressive increase of two percent.⁶ The minimum wage increase is assumed for only three types of workers (technical, clerical, and unskilled but not professional), who are likely to face low wages closer to a subsistence level. This assumption reflects the minimum wage incidences in the Philippines, as discussed in Section 2.1. According to the ILO (n.d.a), a minimum wage increase may indirectly increase the wages of workers

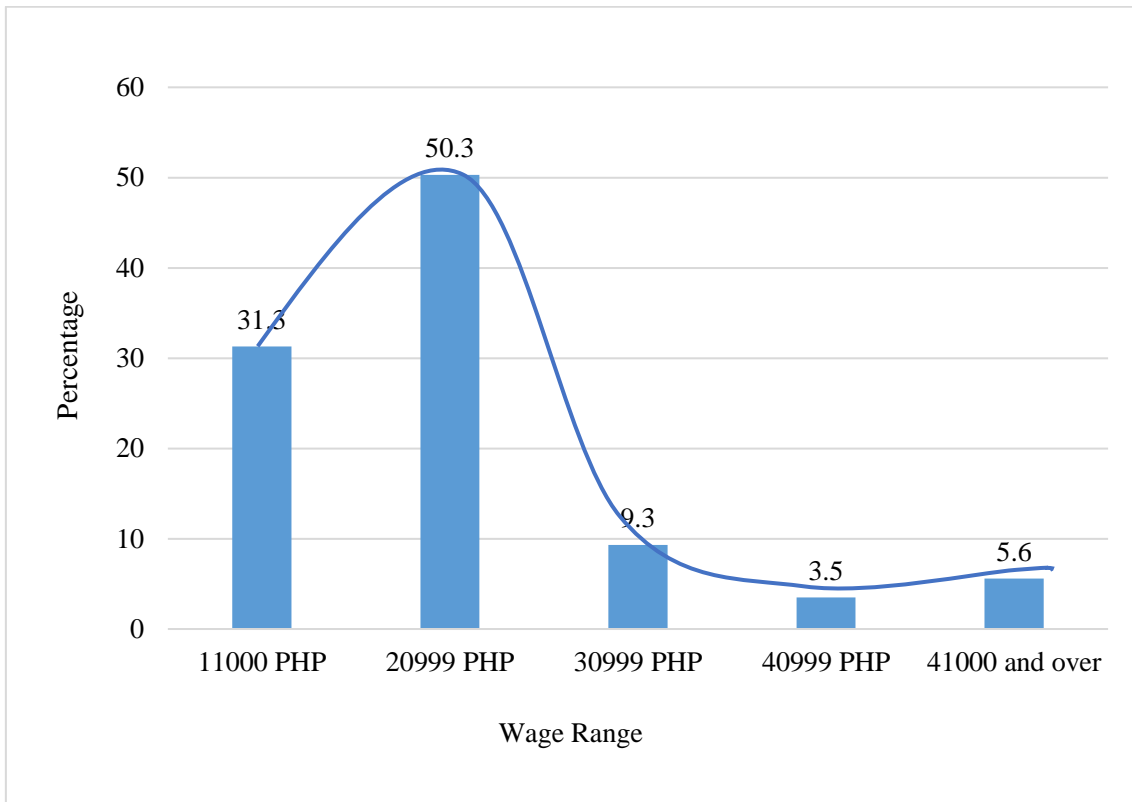
⁶ I also have alternative assumptions of one and three percent for the magnitude of the minimum wage increase. The results are reported in Appendix Section A.1.1., as part of my sensitivity analyses.

earning higher than the minimum wage to allow employers to maintain a difference in monetary compensation in terms of skills and experience between minimum wage and non-minimum wage earners. Moreover, Canales (2014) argues that the minimum wage increase affects not only marginal workers but also workers earning 50 percent higher than the minimum wage, which is around 19,500–21,000 PHP per month (Figure 4.1).⁷ Workers earning within this wage range (i.e., 21,000 PHP or less) account for 81.6 percent of the workforce (PSA, 2020c), which encompasses technical, clerical, and unskilled workers based on the distribution of employed workers by occupation (PSA, 2020d).⁸

⁷ This computation is based on the median wage of 13,000–14,000 PHP per month (PSA, 2020c) and on the finding that the median wage is almost equal to the minimum wage level (PSA, 2019).

⁸ As part of my sensitivity analysis, I conduct an additional minimum wage experiment by assuming a narrower coverage of minimum wage, where only unskilled worker wages are regulated. In this experiment, I find that domestic income losses and remittance income receipts would be lower because only unskilled workers would migrate abroad and domestic employment would recover faster (after 6 to 7 periods), but results remain qualitatively the same. Detailed explanations are provided in Appendix Section A.2.2.

Figure 4.1. Percentage Distribution of Wages among Filipino Workers.



Source: 2020 Occupational Wages Survey

Generally, wages vary among workers even with the same skill or in the same labor force category; thus, a minimum wage regulation is expected to be binding only for employment of marginal workers, who earn almost as little as regulated wages of, typically, low-skilled workers (Gerritsen & Jacobs, 2020; Hohberg & Lay, 2015; Sugiyarto & Endriga, 2008). By contrast, in the Philippines, median wages are close to the minimum wage; this indicates that the minimum wage regulation is binding for most Filipino workers and that an increase in the minimum wage would almost directly affect

the market wage.⁹ As long as the minimum wage regulation is binding, the market wages are determined by the minimum wage, which is assumed to be manipulated by the government exogenously.¹⁰ Note that while the actual minimum wage is defined in nominal terms, wages and prices in my CGE model, based on the Arrow-Debreu model, are expressed against the numeraire price of the CPI. Thus, the assumed minimum wage increase is an increase against the CPI.

4.3. Effects on Industry and Employment

The change in the minimum wage for technical, clerical, and unskilled workers would affect domestic production. Table 4.2 shows output changes, ranked from most affected sector to least. Theory predicts that sectors with more (non-professional) labor-intensive technology would be affected more strongly. The expected output changes are generally consistent with the non-professional labor intensity (the first column of Table 4.2). However, the manufacturing and other primary sectors, the sectors with the largest decrease in output, have much lower labor intensity than the agriculture sector. A general equilibrium perspective enhances the understanding of those results. The minimum wage increase would promote migration and increase remittance inflows, which, in turn, would give rise to the Dutch disease phenomenon, wherein remittances make the home currency

⁹ The minimum wage bite (i.e., the ratio of minimum to median wage) for non-agriculture industries in NCR ranged between 89 and 107 percent during 2001–2018 (PSA, 2019).

¹⁰ In Chapter 5, I further elaborate on this specification to accommodate both binding and non-binding minimum wage constraints using complementary slack conditions.

appreciate and discourage exports. Since the manufacturing and other primary sectors are export-oriented, they would be hit hard.

Table 4.2. Sector Profile and Impacts on Output due to a Two Percent Minimum Wage Increase.

Sector	Non- Professional Labor Intensity* [%]	Simulation Results		
		[Change from the Base, %]		
		Output	Export	Import
Manufacturing	23.0	-2.2	-3.1	0.3
Other Primary	17.0	-1.1	-1.9	-0.0
Agriculture	45.0	-0.8	-2.5	1.2
Wholesale and Retail Trade	21.3	-0.6	-1.0	-0.0
Food and Beverages	14.0	-0.5	-1.2	0.3
Petroleum	12.7	-0.5	-0.9	-0.1
Service	25.4	-0.3	-0.9	0.4
Transportation	6.7	-0.3	-0.6	0.1
Finance	18.2	-0.3	-0.2	-0.4

* Intensity of Technical, Clerical, and Unskilled Workers in Sectoral Value Added, computed from the 2012 SAM.

Source: Column 2 is based on data, while columns 3, 4, and 5 are the author's simulation results.

The non-professional labor intensity of the service sector is comparable to that of the most affected manufacturing sector, yet the service sector falls under the least affected group. The latter is partly because the Dutch disease would induce the reallocation of more resources to the non-tradable sector (i.e., the service sector) and partly because remittances would increase household income, a large part of which is spent on service consumption (Tabuga, 2008), which would mitigate the service output decline.

The minimum wage increase would reduce domestic labor demand, especially for unskilled labor, and consequently hamper domestic employment and industries. With the same increase in the minimum wage, the three types of workers would experience loss of domestic jobs on a similar scale, but only a few workers in those groups would become voluntarily unemployed (Table 4.3). Since the effects of the minimum wage increase on voluntary unemployment in my study are negligible, the decrease in domestic employment is almost always equivalent to the increase in migration.¹¹ As domestic employment declines, domestic wages would be lower. As a result, foreign wages would be relatively higher, encouraging workers to migrate abroad. Professional labor would suffer slight collateral damage because the other types of labor hired to complement professional labor would lose their jobs in the economy. Notably, the affected domestic workers, especially the unskilled ones, would almost fully migrate. Workers in Luzon and Visayas would be slightly more inclined to migrate than those in the other two regions.

¹¹ This is because I assume a large elasticity of transformation of six (Bertoli et al., 2016) which implies flexible allocation between domestic and foreign labor, and domestic workers can easily migrate.

Table 4.3. Impacts on Domestic Labor Employment, Unemployment, and International Migration due to a Two Percent Minimum Wage Increase [Unit: Changes of Employment and Unemployment in Percent of Total Labor Endowment for each Labor Type].

Household	Professional labor			Technical labor			Clerical Labor			Unskilled labor		
	Emp	Unemp	Mig	Emp	Unemp	Mig	Emp	Unemp	Mig	Emp	Unemp	Mig
NCR	-0.02	0.01	0.02	-0.36	0.01	0.34	-0.33	0.02	0.31	-0.42	0.02	0.40
Luzon	-0.03	0.00	0.03	-0.45	0.01	0.45	-0.56	0.01	0.55	-0.57	0.01	0.55
Visayas	-0.03	0.00	0.03	-0.49	0.00	0.48	-0.42	0.01	0.41	-0.39	0.01	0.37
Mindanao	-0.02	0.00	0.02	-0.36	0.01	0.35	-0.39	0.01	0.38	-0.38	0.01	0.36
Total	-0.10	0.01	0.09	-1.67	0.03	1.62	-1.69	0.04	1.64	-1.75	0.05	1.68

Source: Author's Simulation Results.

Note: Some values are not exactly equal to the total due to rounding errors.

4.4. Effects on Household Welfare and Unintended Outcomes

As predicted in the right panel of Figure 1.2, the minimum wage increase would boost household income, increasing the expenditure on the consumption of goods and leisure. The welfare measurement of equivalent variations (EVs) is computed based on that increase (Table 4.4). The welfare impacts differ widely across the four households. The NCR would gain the most, as large as 217 PHP, comparable to three days' worth of minimum wage at that time. Mindanao, the poor region, would receive the second-largest welfare gains, followed by Luzon and Visayas. Although all households would experience better welfare, it does not necessarily mean better equality among them. Thus,

I need an inequality indicator such as the Gini coefficient. I find that the minimum wage increase would change the Gini coefficient only marginally, as computed using per capita household expenditures.¹²

Household gains can be anatomized by scrutinizing changes in income by source. Across all four households, the major driver is remittances. The households in the NCR would have the largest gains in remittances but also the largest losses in income from professional labor and domestic capital, both of which are outside the scope of the government intervention by the minimum wage. By contrast, households in Mindanao's second-largest welfare gains can be attributed to the smallest losses in professional labor and capital income and moderate gains in the other three labor incomes, despite the smallest gains from remittances. Households in Luzon and Visayas would receive the second- and third-largest remittance income gains, achieved by mobilizing their domestic non-professional workers abroad, more than those of households in the NCR and Mindanao (Table 4.3). However, those gains bring relatively larger losses in domestic labor incomes (Table 4.4). The expenditure gains—larger than the income gains—are mainly attributable to the decrease in direct tax payments, which are not levied on remittance income.¹³

¹² The computed Gini coefficients are 0.699956 and 0.699952. The magnitude of the change is 0.000004.

¹³ Appendix Table A. 4 shows changes in savings and direct tax payments.

Table 4.4. Impacts on Household Welfare and Income due to a Two Percent Minimum Wage Increase [Unit: PHP].

	Welfare in EV		Per Capita Income Change (PHP)						Total
	Per Capita (PHP)	% of Initial Income	Professional Labor	Technical Labor	Clerical Labor	Unskilled Labor	Capital	Remittance	
NCR	217	0.17	-146	-21	39	-16	-423	685	118
Luzon	60	0.08	-67	-73	-79	-100	-328	665	18
Visayas	35	0.05	-52	-99	-10	10	-317	468	-0
Mindanao	108	0.16	-50	2	1	20	-252	376	98

Source: Author's Simulation Results.

Note: Changes in total expenditure and income do not perfectly match due to direct tax payments and savings as well as the difference of measurements between EVs (based on expenditure function with Laspeyres prices) and income (deflated by CPI).

The NCR would outperform the three non-capital regions (Luzon, Visayas, and Mindanao) in terms of total per capita income changes, while Mindanao would receive the second-largest gains to narrow the income gap from Luzon and Visayas (Table 4.4). The former worsens the inequality incidence and offsets the improvement of the latter. Overall, nationwide inequality would neither be improved nor worsened.

Behind the positive welfare improvements driven by remittances and the neutral outcome on inequality, the minimum wage increase would negatively impact the government budget. The shift from domestic wage to migrant remittance income would erode one of the major tax bases since remittance income is not subject to direct tax. Moreover, migration reduces domestic labor resources, and in turn, domestic production,

leading to losses in taxes levied on domestic industries. The income tax and production tax losses would reach 0.5 and 0.6 percent of income and production tax revenues on domestic industries, respectively. Although a minimum wage increase does not impose any fiscal costs, these unintended revenue losses should be considered part of the policy costs of increasing the minimum wage.

4.5. Conclusion

The minimum wage is often used as a policy intervention tool to mitigate low income and inequality without incurring fiscal costs. Using a structural CGE model featuring endogenous migration, I simulate a minimum wage increase in the Philippines to examine the impact of such an increase on micro- and macroeconomic variables and to elucidate the pivotal role of migration. The migration option allows households to gain from the minimum wage increase and enables workers, especially unskilled ones, who lose their jobs to find employment abroad; however, migration would lead to currency appreciation that would undermine export competitiveness and harm the domestic industries.

The minimum wage increase in the Philippines would lead to higher consumption, lower production, and greater reliance on remittances. Remittances would improve the livelihood of all household groups but would impact them differently based on their per capita income changes. Household inequality would neither improve nor worsen because the poor household group gains the second most in terms of welfare even though the rich group would gain the most from the minimum wage increase. My experiment shows that the richest group would gain the most, so the government should reallocate these gains to

other groups with smaller gains due to the minimum wage increase. Although taxing remittances would be difficult, as discussed in Section 2.2, the government should continue to establish a more transparent and equitable tax system covering international money flows to catch up with globalization and recent Fintech developments. Since the minimum wage increase incurs indirect fiscal costs in the form of tax base erosion, the government should consider less distortionary interventions. Instead of artificially supporting market wages by minimum wage regulation as a short-run solution to poverty alleviation, the government should formulate policies that stimulate job creation and increase labor demand large enough for market wages to exceed the minimum wage level in the long run. In the next chapter, I examine the impacts of FDI promotion on domestic employment, which would be negatively affected by the minimum wage increase.

5. Foreign Direct Investment Study

5.1. Introduction

Many developing countries rely on foreign sources of capital because domestic sources of capital are usually not sufficient. According to Bocchi (2008), total investment in the Philippines is declining mainly because of lower domestic investment. In the 2000s, domestic investment decreased by 80 percent, while FDI dropped by 15 percent. Domestic investment has fallen for the following reasons. The government, bound by fiscal difficulties, needs more funding to increase domestic investment at existing GDP growth rates. On the other hand, the private sector finds it difficult to increase domestic investment because returns to private investment depend on the government's public capital spending. By contrast, the Philippines could boost its growth by relying on external sources of capital, as other Asian economies have achieved. For example, affiliate firms in emerging subsectors in the service industry, such as the ICT and business processes outsourcing (BPO) sectors, are established in developing countries by FDI from developed countries to save on factor input costs, especially labor costs.

Attracting FDI is a development strategy to enhance productive capacity positively associated with domestic employment and output and further linked to economic growth. In contrast to short-term portfolio investments, FDI is considered a major source of foreign capital that is semi-permanent and may complement existing domestic resources such as domestic labor and land. In addition, FDI creates jobs while allowing transfers of technology and human capital skills to host countries that cannot be achieved by trade in exports or other financial investments. Thus, FDI is expected to be

a major catalyst for development, and the Philippines can achieve larger economic growth by aiming at economic policies that further liberalize foreign investments (Damooei & Tavakoli, 2006).

As demonstrated in Chapter 4, the minimum wage increase would bring income gains to households through the domestic wage increase favoring workers who remain employed and through remittance increases from workers who lose their jobs and migrate abroad. Even with such gains, it would cause concern for the domestic economy because outward migration would decrease the domestic labor supply and production. Thus, some complementary policy measures are needed because minimum wage is preferably utilized not only with pro-employment policies but also in a business environment where firms can thrive (ILO, n.d.b). However, various policy options to improve the business environment and attract FDI are often considered deregulatory for firms. The Philippines, like many other developing countries, has been restrictive to foreign firms, but the country has been gradually phasing out restrictions, as explained in Chapter 1. To address this, the Philippine government has recently proposed amendments to the Foreign Investment Act and enacted the Retail Trade Liberalization Act and Public Service Act. In this context, I consider an FDI promotion policy to complement the minimum wage increase because foreign capital in the form of FDI is expected to create jobs and boost domestic employment, resulting in higher household income and welfare.

The objective of this chapter is to determine how much additional FDI would neutralize the negative effects of the minimum wage on domestic employment. With new job opportunities, workers who have migrated out would return and increase domestic income, which would improve household welfare. If jobs are created to address the poor households who lose jobs due to the minimum wage increase, FDI could also alleviate

the inequality incidence. As discussed in Chapter 1, the minimum wage regulation distorts labor markets. If domestic job opportunities are generated enough to shift the labor demand to push market wage rates above the regulated minimum wage level, the distortionary effects of the minimum wage would vanish, and minimum wage may no longer be needed as a mechanism to keep the domestic workers' wage above the subsistence level. Thus, I extend the static CGE model into a recursive dynamic model to identify the impacts of FDI on output, household welfare, and inequality while following the same assumption in Chapter 4 where the minimum wage increase applies to technical, clerical, and unskilled workers. I also estimate how much FDI is necessary to recreate similar job opportunities lost from the minimum wage increase. Lastly, I present some recommendations regarding FDI to assist policymakers at the end of this chapter.

5.2. Simulation Scenarios

I assume two shocks in factor markets. First, I increase the minimum wage by two percent, as I have assumed in Chapter 4. In this dynamic analysis, I assume this increase is kept throughout my 15-year simulation period. Second, I assume an FDI increase. FDI is an exogenous variable and is assumed to grow at the population growth rate pop or 1.72 percent in the BG-BAU path; I assume 40 percent larger FDI in the first period and keep its exogenous growth rate of 1.72 percent throughout the simulation period.¹⁴

¹⁴ I conduct sensitivity analyses with alternative assumptions in elasticities, population growth rates, and investment parameters. Their results regarding domestic employment, output, and household welfare are

Among many alternative options for the magnitude of FDI shocks, I choose (to display) the results of the 20, 40, 50, and 100 percent increases.¹⁵ The 20 percent increase case presents a more conservative outlook on FDI growth. Indeed, it is highly uncertain how much FDI can grow through the years, but based on the historical FDI increase of 120 percent as indicated in Chapter 1, FDI would likely grow much faster. To explore the impacts of such higher increases in FDI, I experiment with various FDI increases of 40, 50, and 100 percent. The 40 percent increase case demonstrates that domestic jobs would be additionally created enough to re-attract migrant workers. The 50 percent increase case is in line with the actual increase in 2021 FDI inflows in the Philippines of 54 percent (United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), 2022). The 50 percent and 100 percent increase cases would show that the FDI acceleration could make the minimum wage regulation non-binding by increasing labor demand and pushing market wages above the minimum wage level.

5.3. Effect on Industry, Domestic Employment, and Migration

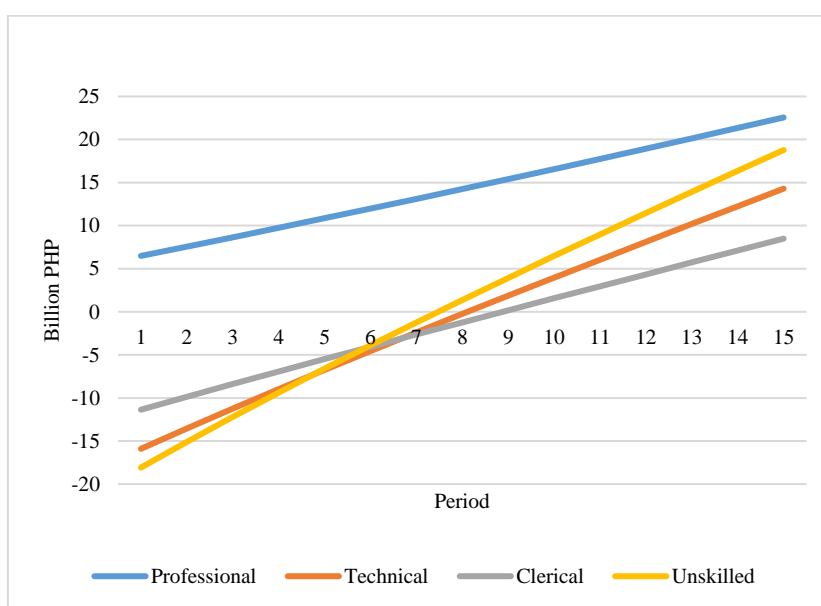
In the short run, the minimum wage increase would negatively affect the domestic employment of non-professional workers in the static model simulation in Chapter 4 (Table 4.3). The FDI increase would cause only a small impact in the short run (Figure 5.1). Thus, the negative effects of minimum wage on domestic employment dominate the

reported in Appendix Sections A.2.3 to A.2.7, which are qualitatively robust and consistent with the results in the main text.

¹⁵ Cases with a few more alternative assumptions in FDI increases are presented in Appendix Section A.2.1.

positive effects of FDI on job creation. In around 7 to 8 periods, FDI would accumulate and promote domestic production, which would be large enough to stop further migration of non-professional workers (Figure 5.1). In the earlier periods, non-professional labor-intensive sectors are negatively affected by the minimum wage increase. In the later periods, FDI acceleration would boost foreign capital-intensive sectors, such as manufacturing, wholesale and retail trade, finance and service sectors, among others.¹⁶

Figure 5.1. Impacts on Domestic Employment Level [Deviation from the BG-BAU Level, Unit: Billion PHP].



While domestic employment would increase in all types of workers, the increase in unskilled labor employment appears to be the largest. The major drivers are different

¹⁶ See Appendix Table A. 16 for foreign capital factor intensity.

among the four types of labor (Figure 5.2). The increase in professional labor employment is primarily driven by the service sector with some additional growth by the manufacturing sector, whose output is accelerated by FDI in the long run. Domestic employment of technical workers is largely dependent on the growth of the manufacturing and service sectors. The demand for clerical workers is driven largely by the service and wholesale and retail trade sectors. These three sectors (manufacturing, service, and wholesale and retail trade) indeed appear as the leading sectors in output (Figure 5.3). By contrast, unskilled employment changes are largely attributable to the growth of the agriculture sector and, in smaller magnitude, the service sector. While the service sector is indeed the leading sector in output, the agriculture sector is not. As the agriculture sector does not employ any foreign capital but only domestic capital and labor, no FDI can directly accelerate its growth. However, FDI would allow FDI-host sectors, such as the manufacturing sector, to substitute foreign capital for domestic capital (Figure 5.4). The domestic capital released from those sectors is mobilized to the agriculture sector. This indirect effect of FDI on the agriculture sector would create many job opportunities for unskilled workers.

Figure 5.2. Impacts on the Demand for Labor [Deviation from the BG-BAU Level, Unit: Billion PHP].

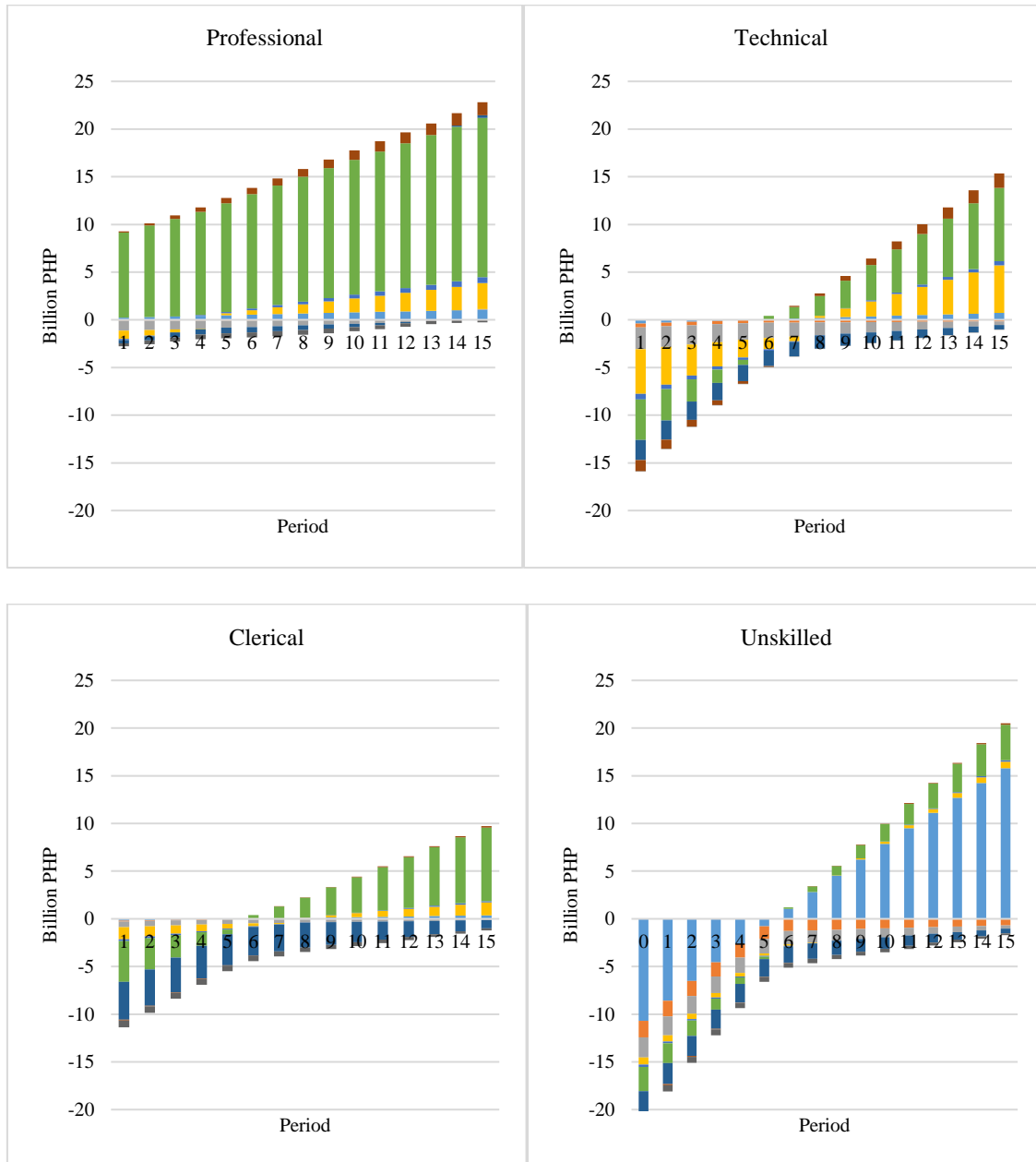


Figure 5.3. Impacts on Output [Deviation from the BG-BAU Level, in Percentage Change].

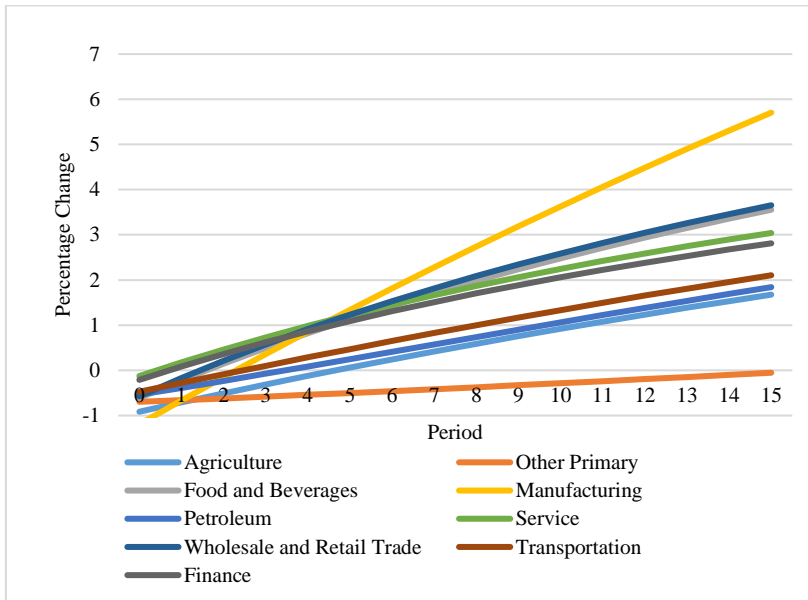
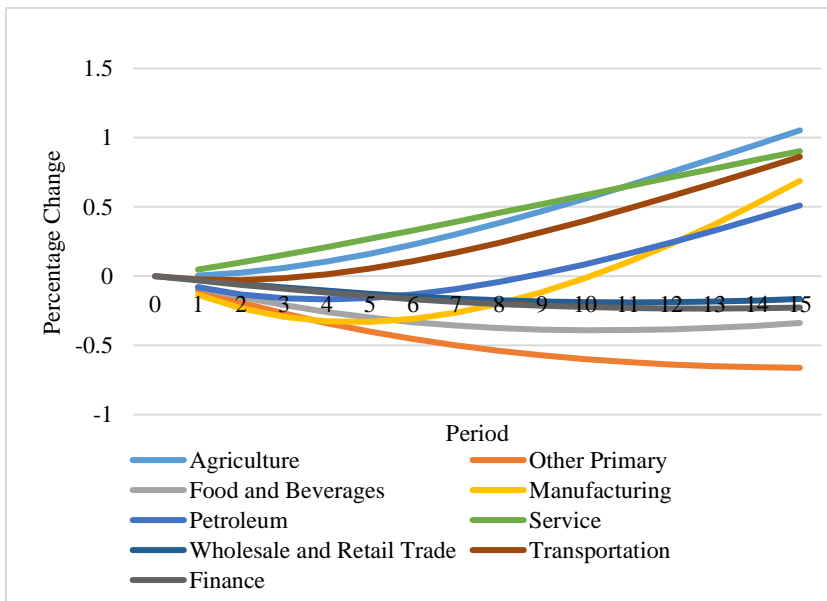


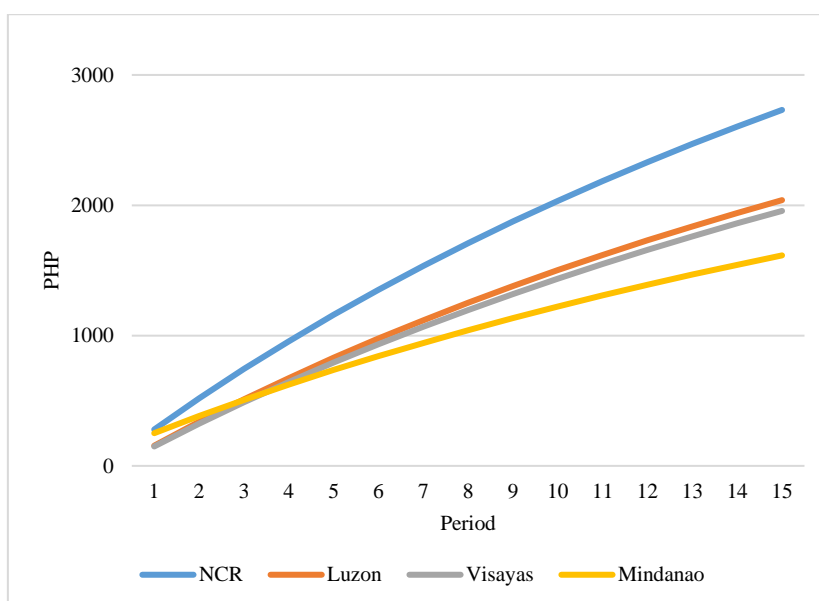
Figure 5.4. Impacts on Domestic Capital [Deviation from the BG-BAU Level, in Percentage Change].



5.4. Effect on Household Welfare and Inequality

Short-run welfare gains (in terms of EV per capita) from both FDI and minimum wage would benefit households in the NCR the most, followed by those in Mindanao (Figure 5.5). Households in Luzon and Visayas would gain relatively smaller. As discussed above, it would take time for FDI to accumulate a sizable amount of foreign capital to boost domestic production. In the earlier periods, the gains are attributable mostly to increases in remittances sent by migrants due to the minimum wage increase as demonstrated in Chapter 4 (Table 4.4).

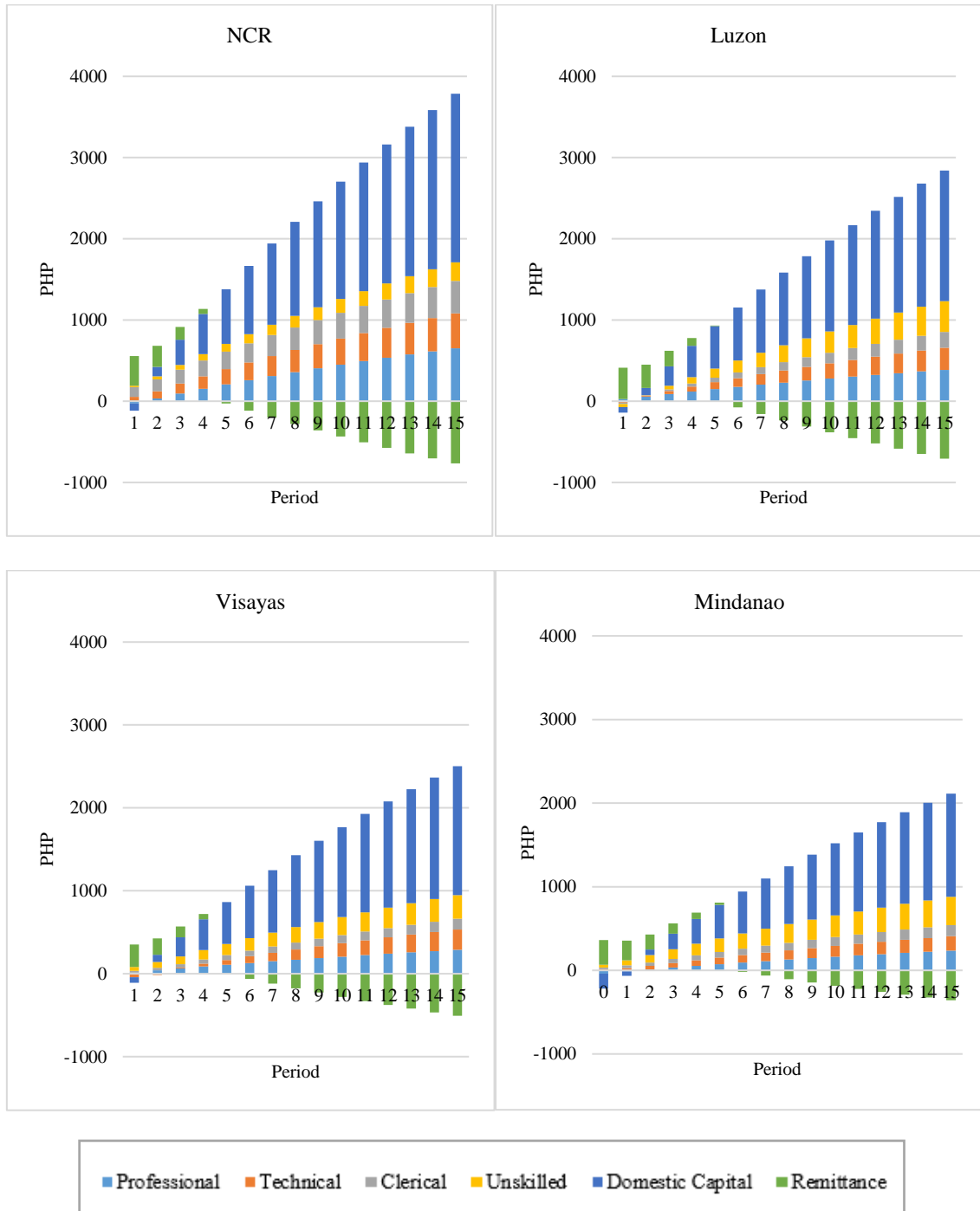
Figure 5.5. Equivalent Variation per Capita [Unit: PHP].



In the long run, welfare gains would be brought to all households but in different magnitudes. The NCR, followed by Luzon and Visayas, would grow fast, while Mindanao would lag behind (Figure 5.5). The contrast in gains between the NCR and

Mindanao provides a good implication about the mechanism of how the FDI increase brings welfare gains. The fastest welfare improvements in the NCR are attributed to increased professional labor and domestic capital income (Figure 5.6). The FDI inflows would increase the production of the service sector (Figure 5.3), which would significantly benefit professional workers (Figure 5.2). Larger FDI inflows would make domestic capital relatively more precious and thus benefit the NCR through domestic capital income significantly (Figure 5.4). By contrast, Mindanao is endowed with the smallest amount of domestic capital and with the largest amount of unskilled labor among the four households (Table 4.4). As discussed above, a large part of unskilled labor is employed in the agriculture sector, which would benefit only indirectly from the FDI acceleration. Thus, households in Mindanao would enjoy the benefit of the FDI increase the least.

Figure 5.6. Impacts on Household per Capita Income by Source of Income
[Deviations from the BG-BAU Level, Unit: PHP].



FDI would create more job opportunities and re-attract workers who have migrated out. The return of migrants would eventually increase income from domestic employment and reduce remittances. The FDI increase would also retain the initial order of household welfare levels as reported in Chapter 4 (Table 4.4), where households in the NCR earn the largest per capita income, followed by Luzon, Visayas, and Mindanao, whose per capita income is the smallest. Therefore, like the static model results, inequality among the four households would neither improve nor worsen; the Gini coefficient reports infinitesimal changes.¹⁷

5.5. Alternative Simulation Scenario: Departure from Minimum Wage Level

FDI can revitalize domestic production and increase labor demand to push wages above the institutionally-determined minimum wage (Figure 5.7), but the magnitude assumed in the previous sections would not be sufficiently large. In contrast to the (unregulated) professional wages showing an upward trend, the three non-professional workers' (regulated) wages would be as low as the minimum wage (Figure 5.8). In this additional experiment, I determine how much FDI can make market wages depart from the minimum wage level in reference to Figure 5.8 as the baseline case.

¹⁷ The computed Gini coefficients based on expenditure levels without and with the FDI increase are 0.704059 and 0.703899, respectively.

Figure 5.7. Impacts on Labor Markets with both Minimum Wage and Accelerated FDI Increase.

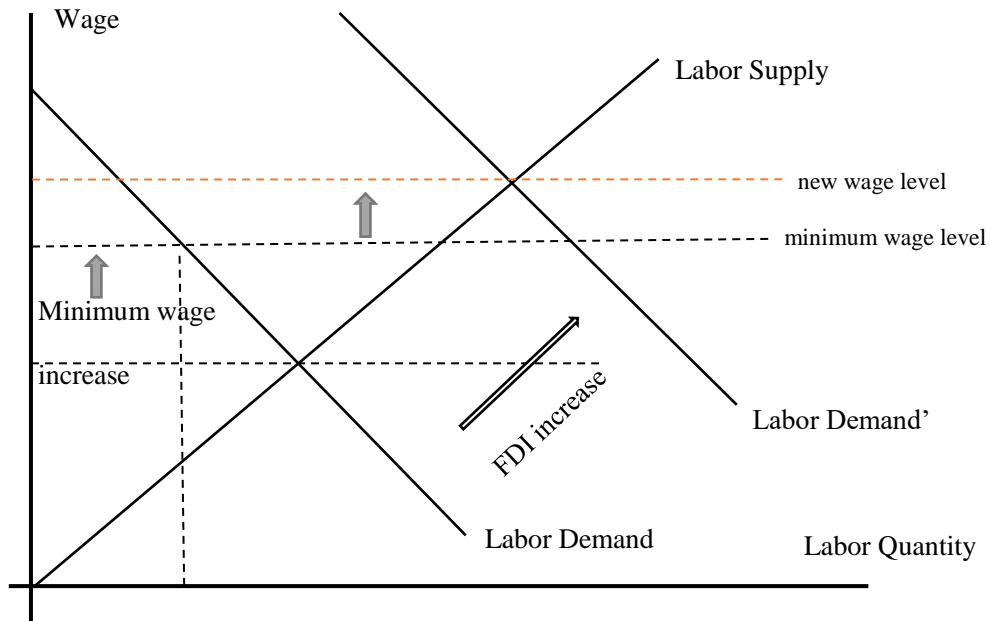
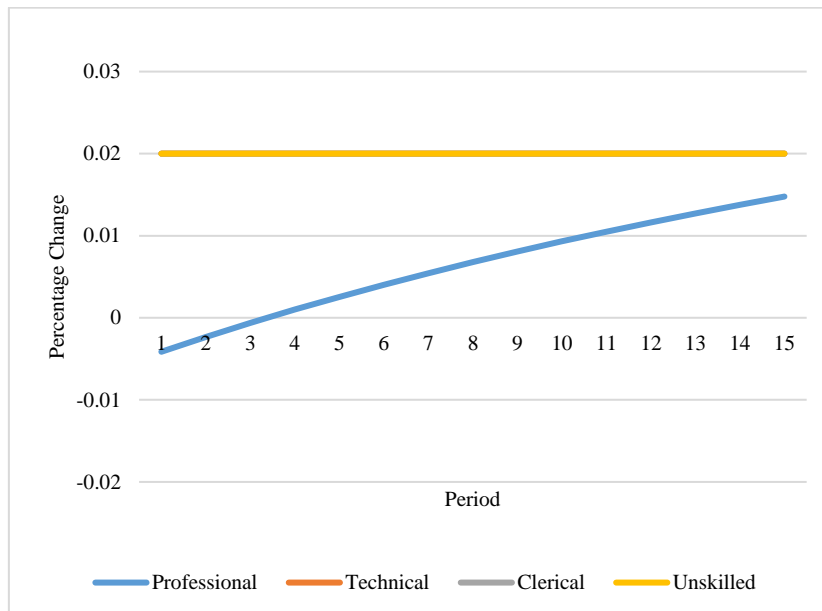


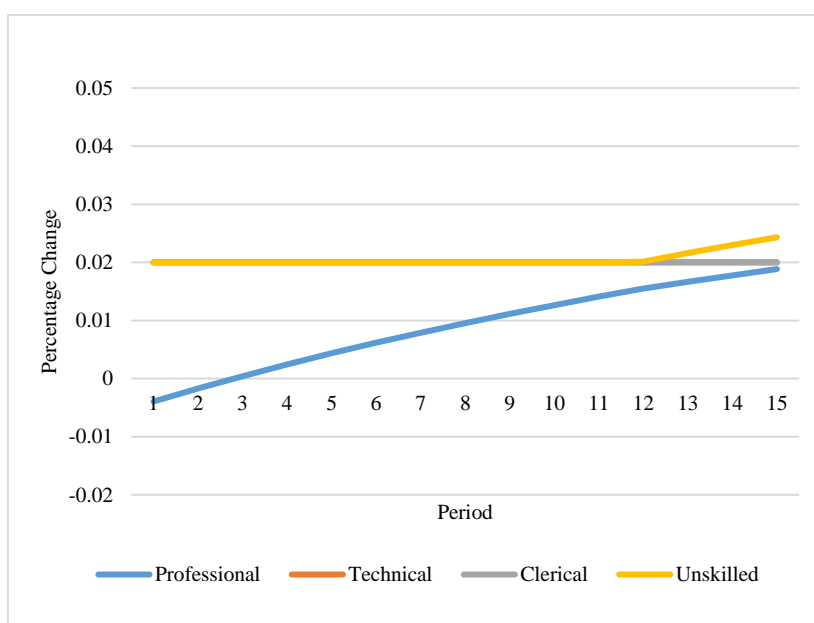
Figure 5.8. Impacts on Wage Rates due to an FDI Increase of 40 Percent [Deviation from the BG-BAU Level, in Percentage Change].



Note: Technical, clerical, and unskilled worker wage changes are the same, and they overlap with each other.

An accelerated FDI increase by 50 percent throughout the simulation period, instead of the 40 percent increase assumed in the previous sections, would make the minimum wage of unskilled labor non-binding after 12 periods, while wages of clerical and technical labor are still at the minimum wage level (Figure 5.9). This wage rise in the unskilled labor market is mainly attributable to the growth of the agriculture sector, which is the most unskilled labor-intensive sector (Figure 5.2), that would increase domestic employment in the long run (Figure 5.1) by exploiting domestic capital released from other sectors that accept a large amount of FDI (Figure 5.4). Similar impacts arise in the service sector that would benefit from the second-largest domestic capital increase in the same mechanism.

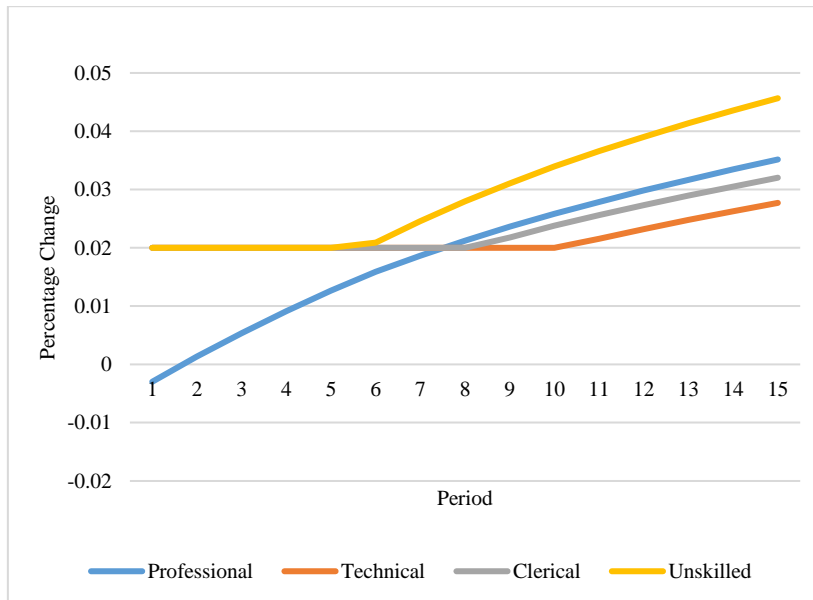
Figure 5.9. Impacts on Wage Rates due to an Accelerated FDI Increase of 50 Percent [Deviation from the BG-BAU Level, in Percentage Change].



Note: Technical worker wage changes are the same as clerical worker wage changes, and they overlap with each other.

Simulating further acceleration of FDI, a 100 percent FDI increase (i.e., permanently doubled FDI inflows) would make the minimum wage constraint non-binding for all workers (Figure 5.10). Following unskilled workers' wages, clerical and technical workers' wages would depart from the minimum wage level. In this alternative scenario, jobs created by the service and manufacturing sectors for clerical and technical workers, respectively, mainly drive the evolution of their wages. Given the historically high growth of FDI in the rapidly globalized Asian economies, the Philippines might be able to attract FDI as large as I assume in my simulations. It is also crucially dependent on whether the government can continue to commit to fostering an outward-oriented economic environment.

Figure 5.10. Impacts on Wage Rates due to an Accelerated FDI Increase of 100 Percent [Deviation from the BG-BAU Level, in Percentage Change].



5.6. Conclusion

Chapter 5 studies the impacts of an FDI increase in the presence of the minimum wage regulation on the Philippine macroeconomy. Both FDI and minimum wage increases are expected to be well-intended for the sake of poor households. On the one hand, the minimum wage increase is aimed at supporting low-wage workers and combat household inequality, but it results in lower domestic employment, currency appreciation, and tax base erosion. While these effects are found in my static model analysis in Chapter 4, I confirm that these effects also stand out in the short run in my dynamic analysis. On the other hand, FDI is expected to create new jobs and enhance productive capacity to stimulate output and economic growth. My focus is on how much FDI can create enough jobs to re-attract workers who would lose their jobs in the domestic economy due to the minimum wage increase.

My experiments using FDI provide contrasting results in employment by worker types; the unskilled workers would benefit from FDI the most. A permanent FDI increase by 40 percent would create jobs and reverse the migration effect brought about by the minimum wage increase but it would take 7 to 8 periods. Production would increase in all sectors, especially those sectors bearing more foreign capital, such as manufacturing, wholesale and retail trade, finance and service. The agriculture sector, which does not employ any foreign capital but only domestic capital, would be indirectly affected by the positive spillover effects from the FDI increase that would urge other sectors to release domestic capital to the agriculture sector.

Households in the NCR would gain the most in terms of welfare largely because they earn the largest income per capita driven by domestic capital income. Even though

non-professional workers would gain from higher domestic employment, the inequality incidence would neither improve nor worsen. Households in Mindanao, the poorest household group, would still get the smallest per capita income gains, while the richest household group, the NCR, would still get the largest per capita income gains in the long run. Lastly, large FDI inflows would provide job opportunities and push market wages higher than the subsistence level that the minimum wage is expected to attain. The required FDI increases are 50–100 percent, which may be achievable in light of the historically high growth of FDI in the Philippines and Asia.

6. Conclusion

6.1. Summary of Study and Main Findings

This dissertation aims to study the effects of minimum wage and FDI increase in the Philippines using static and dynamic CGE models. I identify the research gaps in the literature on minimum wage and international factor mobility and their impacts in Chapter 2. Chapter 3 elaborates on the methodology and describes the data used in the study. In Chapter 4, I focus on the impacts of a minimum wage increase on output, domestic employment, international migration, household welfare, and inequality, while in Chapter 5, I verify whether FDI can offset the outward migration effects brought by the minimum wage increase. I also identify important sectors and labor types affected by FDI and the resulting welfare gains arising from the FDI increase.

In the static model with a two percent minimum wage increase in the three labor markets except in the professional labor market, I observe intended outcomes such as lower domestic employment, and unintended outcomes such as outward migration, currency appreciation, tax base erosion, and persistent inequality. Remittance causes positive welfare gains for all households because the large remittance incomes would compensate for the losses in domestic labor incomes arising from international migration. The increase in remittance incomes implies that workers lose their jobs and the domestic currency appreciates, dampening the domestic industry and shrinking the tax base. These effects could undermine the economy's growth potential in the long run, which can be examined only in a dynamic analysis, where the evolution of domestic employment and capital accumulation are integrated into one model framework.

To mitigate the unintended outcomes of the minimum wage increase, an FDI increase is another policy instrument in the dynamic model to complement the minimum wage and recover the lost employment due to international migration. I find that all household groups, in the short run, would have positive welfare gains in the dynamic model, which is in line with the static model results. Remittance incomes are also comparable to those in the static model. With time, however, I observe that remittance income would decrease and would be replaced with increasing domestic labor and capital incomes because of FDI boosting output and domestic employment. FDI would discourage international migration caused by the minimum wage increase and encourage domestic employment after 7 to 8 periods. Welfare would improve for all households, but overall inequality would neither be improved nor worsened, given the assumed increases in the minimum wage and FDI. As for sectoral outcomes, the FDI increase would not only positively affect manufacturing, wholesale and retail trade, and service sectors but also indirectly impact the agriculture sector because foreign capital would replace domestic capital in the FDI-host sectors, and domestic capital would be reallocated to the agriculture sector. Lastly, my simulation result indicates that FDI inflows must be doubled to increase market wages above the minimum wage level.

With this general equilibrium analysis of minimum wage with international factor mobility, I derive not only the abovementioned direct policy implications but also more general implications in policy design and evaluation in the context of the Philippine economy and developing economies. They are discussed below.

6.2. Policy Implications and Recommendations

The effects of cross-border labor mobility in the form of labor migration, as measured by a structural macroeconomic framework, have received little attention in the current literature. The results of my static and dynamic analysis in Chapter 4 and Chapter 5 reveal how minimum wage and FDI influence the Philippine economy and how outward migration activities arising from the minimum wage increase can be mitigated by job creation arising from the FDI increase. Not only are there expected outcomes in my analyses such as lower domestic employment, but also unexpected outcomes, such as higher migrant remittances, currency appreciation, and tax base erosion in Chapter 4 and higher domestic employment of unskilled labor in the agriculture sector in Chapter 5. In this regard, I will provide policy implications and recommendations for policymakers to manage these unexpected outcomes below.

The results of Chapter 4 imply that the impact of migration and remittances on the Philippine economy cannot be underestimated. In Chapter 4, I show how migrants' remittances would increase domestic household income and consumption, but international labor migration would result in lower tax revenues. Thus, to compensate for the unexpected lost tax revenue due to worker migration, I suggest that the government more strictly and efficiently administer tax collection so that the government can spend more on policies and social programs to assist the poor household group, for example, by providing conditional cash transfers, granting subsidies or allocating public expenditures on education and health. The government needs to improve the tax system to cover and impose taxes on new Fintech instruments and financial assets, such as cryptocurrencies or non-fungible tokens, which are often used for money transfers to wealthier household

groups in the globalized and digitalized capital markets. Taxing on these digital assets can broaden the tax base and allow stronger reallocation of resources to the poor household group. While managing possible political difficulties, the government should equally tax remittances like other income sources by using more advanced techniques, for example, by digitalizing the process of remittance income tax reporting by migrants or enlisting the help of the migrant destination country's government on behalf of the Philippine government to levy withholding taxes on cross-border payments and remittances. The government should develop a simple and efficient approach to cross-border remittance income taxation, such as a constant tax rate with the exemption for reasonably small remittances, to lower administrative and compliance costs.

With a macroeconomic CGE framework that allows migration, policymakers could now formulate policies to address similar issues in factor mobility in the Philippines, such as brain drain and permanent migration concerning professional workers like nurses, doctors, and engineers, while allowing FDI accumulation with time in a similar framework enables policymakers to be knowledgeable about unintended consequences that may arise with a sudden injection of foreign capital in the economy. The influx of FDI would cause the reallocation of domestic capital to the agriculture sector, which largely benefits the sector's unskilled workers. The agriculture sector is key to attaining inclusive growth in the Philippines because agriculture is the main source of income in rural areas where poverty incidence is high. In Chapter 5, I learn the mechanism by which FDI accelerates the employment of unskilled workers in the agriculture sector that does not receive foreign capital. Thus, the government should formulate policies to ensure and sustain the growth of FDI to promote the agriculture sector indirectly. For example, the government can improve the country's investment climate by pursuing programs to lower

power and utility costs, reforming the justice system to alleviate corruption, and allocating public expenditures to develop road, rail, and telecommunication infrastructure. The government can also focus on improving the ease of doing business in the country by streamlining and automating the procedures for business registration and other government-related transactions to ensure more efficient public service. Although the FINL amendments cannot overturn the Philippine Constitution provisions that forbid foreign ownership in land, mass media, utilities, and natural resource extraction, the FINL can still be revised to exclude educational institutions, construction of public works, and advertising agencies, among others, to encourage foreign stakeholders to invest in these ventures. To strengthen the domestic linkages with foreign affiliates, the Philippine government must adopt a more comprehensive approach to build a business environment conducive to FDI and portray the Philippines as a promising investment location.

In designing policy interventions, it is important to consider different stakeholders affected by the policies. The government should not just focus on its impacts on the domestic economy but on its extended impacts on the international economy as the Philippines have been integrated with the global economy given its high mobility of workers. When the government presumes the economy (or the labor market) is not open to the rest of the world, it is sufficient to examine policy impacts on the domestic economy and also to develop complementary interventions that can alleviate unintended effects such as subsidies, taxes, price controls, and regulation, etc. For example, the government would impose a price floor in the form of a minimum wage that would decrease domestic employment in theory, and it would try to alleviate such outcomes domestically by stimulating the economy through government spending and lower taxes. However, in an open economy, the outcome would change; domestic workers would migrate

internationally and affect the distribution of the global workforce as discussed in Chapter 4. In Chapter 5, I analyze the role of FDI in the Philippine macroeconomy, as the government begins to amend laws to promote foreign capital inflows, given its increasing importance in the globalized world as evidenced in the literature. FDI can improve the country's access to capital, stimulate the economy and mitigate the losses in domestic employment due to international migration. Thus, predictions based on economic theories and principles on how one variable affects another have become more complex; macroeconomic impacts require quantitative assessments because of the several workings present in an open economy.

While my analysis in Chapter 4 focuses on policy shocks given in the domestic economy, shocks in the external sector are equally important and sometimes critical to a small open economy like the Philippines. Policy interventions in other countries, such as foreign wage or foreign GDP shocks, can affect the domestic macroeconomy, but with a structural macroeconomic framework like the CGE model, it would be in a manner that policymakers can predict. Policymakers in the Philippines and other developing countries sharing similar characteristics can formulate better national policies, deal with unexpected outcomes, and implement targeted policies for household groups or sectors that are the most vulnerable to shocks.

6.3. Limitations of the study

There are some limitations to my study. Due to data unavailability, I distinguish only four types of households in my linking of the micro household survey data to the macro SAM and categorize these households by financial capacity using a proxy for

income (i.e., the NCR, Luzon, Visayas, and Mindanao), instead of income classes. It would be of practical value to elaborate on the four household types used here to improve the examination of inequality among heterogeneous households and to classify households using income classes once data becomes available. It is also valuable to link a macro CGE model to a microsimulation model using household survey data as deeper inferences can be obtained with microdata.

The scope of migration undertaken in the study is limited to only temporary migration, in which migrants leave for work but intend to return to their home country after the completion of their employment contracts. It would be interesting to consider the permanent migration of high-skilled labor, a.k.a. the brain drain phenomenon, where migrants leave and settle in the destination country for good. Depending on the severity of permanent migration outflow to other countries, these concerns may need to be addressed in the near future. Shocks in foreign labor markets and cross-border labor mobility, such as the recent fall in labor demand and restrictions on labor mobility resulting from the impact of COVID-19, could also be good policy experiments in a general equilibrium framework.

My methodological approach to defining FDI in the model is limited by certain assumptions. In Chapter 5, I assume an FDI increase that is exogenous. However, it may seem too good to be true for domestic firms to be provided with foreign capital without any costs incurred and efforts done by the domestic firms, except for its remunerations transferred abroad. In the existing FDI literature, several studies have presented FDI as an endogenous variable and attempted to explain FDI changes by lowering barriers to FDI, such as increasing tariffs, taxes, and decreasing export prices, among others. I can enrich my analysis by endogenizing FDI and taking account of its drivers, economic size,

activity levels, and investment climate indicators, as described in the World Bank's Ease of Doing Business Index. While I do not distinguish the destinations of migrants and origins of FDI in my single-country models, I can extend the model to a multi-country model and do so. Lastly, the model does not include the possibility of FDI and migration interacting with each other. There are circumstances wherein a large part of FDI from a country is directed to countries or firms where their citizens reside or work at. It may be worthwhile to analyze the mechanism of migration influencing the flow of foreign capital or the flow of foreign capital affecting migration, such as diaspora investment, by applying the framework used here. These methodological extensions are left for future researchers.

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Appendix

A.1. Static Model Sensitivity Analyses

A.1.1. Varying Magnitude of Domestic Minimum Wage Increase

I assume a two percent minimum wage increase in my simulations. To check the robustness of the results concerning this assumption, I conduct the same policy experiments with the minimum wage raised and lowered by one percentage point. The simulation outcomes in output (Table A.1), welfare (Table A. 2), and employment (Table A. 3) become proportionately larger/smaller, with a larger/smaller shock in all indicators. These findings are qualitatively robust.

Table A. 1. Impacts on Output with One Percent Lower/Higher Percentage Change Cases [Unit: Percentage Change from the Base].

Sector	1% Minimum Wage Increase	2% Minimum Wage Increase (Baseline Case)	3% Minimum Wage Increase
Agriculture	-0.40	-0.80	-1.19
Other Primary	-0.57	-1.13	-1.67
Food and Beverages	-0.26	-0.52	-0.78
Manufacturing	-1.13	-2.23	-3.30
Petroleum	-0.27	-0.54	-0.81
Service	-0.17	-0.33	-0.50
Wholesale and Retail Trade	-0.28	-0.55	-0.82
Transportation	-0.14	-0.27	-0.41
Finance	-0.14	-0.28	-0.42

Table A. 2. Impacts on Household Welfare with One Percent Lower/Higher Percentage Change Cases [Unit: EV per Capita in PHP].

Household	1% Minimum Wage			2% Minimum Wage			3% Minimum Wage		
	Increase			Increase			Increase		
	(Baseline Case)								
NCR	112			217			315		
Luzon	33			60			80		
Visayas	19			35			46		
Mindanao	56			108			156		

Table A. 3. Impacts on Domestic Employment, Unemployment, and International Migration with One Percent Lower/Higher Percentage Change Cases [Unit: Percentage Change from the Base].

Labor Type	1% Minimum Wage			2% Minimum Wage			3% Minimum Wage		
	Increase			Increase			Increase		
	(Baseline Case)								
	Emp	Unemp	Mig	Emp	Unemp	Mig	Emp	Unemp	Mig
Professional	-0.05	0.01	0.04	-0.10	0.01	0.09	-0.15	0.02	0.13
Technical	-0.84	0.02	0.82	-1.67	0.03	1.62	-2.47	0.04	2.40
Clerical	-0.85	0.02	0.83	-1.69	0.04	1.64	-2.52	0.06	2.43
Unskilled	-0.88	0.03	0.85	-1.75	0.05	1.68	-2.60	0.07	2.48

Alternatively, the simulation results in household welfare and income below (Table A. 4; Table A. 5) become proportionately smaller and bigger, assuming one percent, two percent, and three percent minimum wage increases.

Table A. 4. Impacts on Household Welfare and Income with One Percent Lower/Higher Percentage Change Cases [Unit: Per Capita in PHP].

Household	EV	Income						Total Income	Savings	Direct Tax
		Professional Labor	Technical Labor	Clerical Labor	Unskilled Labor	Capital	Remittance			
Smaller Shock: 1% Minimum Wage Increase Case										
NCR	112	-73	-11	20	-8	-213	347	62	1	-41
Luzon	33	-34	-37	-40	-50	-165	339	13	2	-18
Visayas	19	-26	-50	-5	5	-159	238	2	1	-13
Mindanao	56	-25	1	1	11	-127	191	51	5	-6
Baseline Shock: 2% Minimum Wage Increase Case										
NCR	217	-146	-21	39	-16	-423	685	118	3	-81
Luzon	60	-67	-73	-79	-100	-328	665	18	3	-36
Visayas	35	-52	-99	-10	10	-317	468	-0	-0	-27
Mindanao	108	-50	2	1	20	-252	376	98	9	-13
Larger Shock: 3% Minimum Wage Increase Case										
NCR	315	-218	-31	57	-24	-631	1014	167	4	-121
Luzon	80	-100	-109	-117	-148	-489	979	16	3	-53
Visayas	46	-77	-147	-16	14	-472	690	-8	-2	-40
Mindanao	156	-75	3	2	30	-375	558	142	12	-19

Note: Changes in total expenditure and income do not perfectly match because minor elements (e.g., direct tax and savings) and substitution effects are omitted on the income side.

Table A. 5. Impacts on Domestic Employment, Unemployment, and International Migration with One Percent Lower/Higher Percentage Change Cases [Unit: Percentage Change over Total Labor Type].

Household	Professional Labor			Technical Labor			Clerical Labor			Unskilled Labor		
	Emp	Unemp	Mig	Emp	Unemp	Mig	Emp	Unemp	Mig	Emp	Unemp	Mig
Smaller Shock: 1% Minimum Wage Increase Case												
NCR	-0.01	0.00	0.01	-0.18	0.01	0.17	-0.17	0.01	0.16	-0.21	0.01	0.20
Luzon	-0.02	0.00	0.01	-0.23	0.00	0.23	-0.28	0.00	0.28	-0.29	0.01	0.28
Visayas	-0.01	0.00	0.01	-0.25	0.00	0.25	-0.21	0.00	0.21	-0.19	0.01	0.19
Mindanao	-0.01	0.00	0.01	-0.18	0.00	0.18	-0.19	0.00	0.19	-0.19	0.00	0.18
Total	-0.05	0.01	0.04	-0.84	0.02	0.82	-0.85	0.02	0.83	-0.88	0.03	0.85
Baseline Shock: 2% Minimum Wage Increase Case												
NCR	-0.02	0.01	0.02	-0.36	0.01	0.34	-0.33	0.02	0.31	-0.42	0.02	0.40
Luzon	-0.03	0.00	0.03	-0.45	0.01	0.45	-0.56	0.01	0.55	-0.57	0.01	0.55
Visayas	-0.03	0.00	0.03	-0.49	0.00	0.48	-0.42	0.01	0.41	-0.39	0.01	0.37
Mindanao	-0.02	0.00	0.02	-0.36	0.01	0.35	-0.39	0.01	0.38	-0.38	0.01	0.36
Total	-0.10	0.01	0.09	-1.67	0.03	1.62	-1.69	0.04	1.64	-1.75	0.05	1.68
Larger Shock: 3% Minimum Wage Increase Case												
NCR	-0.03	0.01	0.02	-0.54	0.02	0.51	-0.49	0.02	0.46	-0.63	0.03	0.59
Luzon	-0.05	0.00	0.04	-0.67	0.01	0.66	-0.83	0.01	0.80	-0.84	0.01	0.81
Visayas	-0.04	0.00	0.04	-0.73	0.01	0.71	-0.62	0.01	0.60	-0.57	0.01	0.55
Mindanao	-0.03	0.00	0.02	-0.54	0.01	0.52	-0.58	0.01	0.56	-0.56	0.01	0.54
Total	-0.15	0.02	0.13	-2.47	0.04	2.40	-2.52	0.06	2.43	-2.60	0.07	2.48

Some values are not exactly equal to the total due to rounding errors.

A.1.2. Armington Elasticity

The outcome of a CGE analysis is strongly influenced by the assumption of key parameter values, such as the Armington elasticities of substitution/transformation (σ/ϕ). To test the robustness of my simulation results, I perform a sensitivity analysis with a 50 percent lower elasticity and a 50 percent higher elasticity value than the baseline case. Output is affected only marginally by the assumed elasticity parameters (Table A. 6), while higher elasticity tends to increase welfare outcomes, as found in numerous trade policy CGE analyses (Table A. 7). Lastly, Table A. 8 shows that higher Armington elasticity leads to higher migration. Imports can be financed by export earnings and remittance income. Export earnings can be substituted by remittance income, and higher Armington elasticity would make this substitution easier.

Table A. 6. Impacts on Output with 50 Percent Lower/Higher Elasticity Cases [Unit: Percentage Change from the Base].

Sector	50 Percent Lower		50 Percent Higher
	Armington Elasticity	Baseline	Armington Elasticity
	Case	Case	Case
Agriculture	-0.70	-0.80	-0.89
Other Primary	-1.18	-1.13	-0.99
Food and Beverages	-0.49	-0.52	-0.54
Manufacturing	-2.08	-2.23	-2.30
Petroleum	-0.56	-0.54	-0.50
Service	-0.34	-0.33	-0.34
Wholesale and Retail Trade	-0.53	-0.55	-0.56
Transportation	-0.28	-0.27	-0.27
Finance	-0.28	-0.28	-0.28

Table A. 7. Impacts on Household Welfare with 50 Percent Lower/Higher Elasticity Cases [Unit: EV per Capita in PHP].

Household	50 Percent Lower		50 Percent Higher	
	Armington Elasticity		Armington Elasticity	
	Case	Baseline Case	Case	Baseline Case
NCR	188	217	232	
Luzon	44	60	66	
Visayas	27	35	38	
Mindanao	101	108	111	

Table A. 8. Impacts on Domestic Employment, Unemployment, and International Migration with 50 Percent Lower/Higher Elasticity Cases [Unit: Changes of Employment and Unemployment in Percent of Total Labor Endowment for each Labor Type].

Labor Type	50 Percent Lower			50 Percent Higher					
	Armington Elasticity			Armington Elasticity					
	Case	Baseline Case	Case	Case	Baseline Case	Case			
	Emp	Unemp	Mig	Emp	Unemp	Mig	Emp	Unemp	Mig
Professional	-0.02	0.01	0.01	-0.10	0.01	0.09	-0.15	0.01	0.14
Technical	-1.64	0.05	1.57	-1.67	0.03	1.62	-1.68	0.02	1.65
Clerical	-1.68	0.07	1.59	-1.69	0.04	1.64	-1.70	0.03	1.66
Unskilled	-1.71	0.08	1.58	-1.75	0.05	1.68	-1.79	0.04	1.74

A.1.3. Elasticity of Transformation between Domestic-Foreign Labor Market Allocation

Other than the Armington elasticities of substitution/transformation (σ/ϕ), the findings of a CGE analysis could be influenced by the assumed value of elasticity ν used in the CET function that allocates labor between domestic and foreign markets. In my sensitivity analysis, I alternatively assume 3.34 and 8.57, which are the lower and upper bound estimates, set by Bertoli et al. (2016). Output is marginally affected (Table A. 9), while welfare estimates are found to be smaller/larger in lower/higher elasticity cases, respectively, because a higher/lower elasticity represents a decrease/increase of friction in mobility (Table A. 10). Moreover, a higher elasticity allows more flexible adjustment between domestic and foreign labor markets. Thus, their employment shows larger changes (Table A. 11).

Table A. 9. Impacts on Output with Lower/Higher Elasticity Cases [Unit: Percentage Change from the Base].

Sector	Lower		Higher
	Labor Transformation		Labor Transformation
	Elasticity Case	Baseline Case	Elasticity Case
	($\nu=3.34$)	($\nu=6$)	($\nu=8.57$)
Agriculture	-0.80	-0.80	-0.80
Other Primary	-1.11	-1.13	-1.14
Food and Beverages	-0.52	-0.52	-0.52
Manufacturing	-2.19	-2.23	-2.26
Petroleum	-0.54	-0.54	-0.55
Service	-0.33	-0.33	-0.33
Wholesale and Retail Trade	-0.54	-0.55	-0.55
Transportation	-0.28	-0.27	-0.28
Finance	-0.28	-0.28	-0.28

Table A. 10. Impacts on Household Welfare with Lower/Higher Elasticity Cases

[Unit: EV per Capita in PHP].

Household	Lower		Higher
	Labor Transformation		Labor Transformation
	Elasticity Case	Baseline Case	Elasticity Case
	($\nu=3.34$)	($\nu=6$)	($\nu=8.57$)
NCR	210	217	221
Luzon	56	60	61
Visayas	33	35	35
Mindanao	105	108	109

Table A. 11. Impacts on Domestic Employment, Unemployment, and International Migration with Lower/Higher Elasticity Cases [Unit: Changes of Employment and Unemployment in Percent of Total Labor Endowment for each Labor Type].

Labor Type	Lower						Higher		
	Labor Transformation			Baseline Case			Labor Transformation		
	Elasticity Case			Baseline Case			Elasticity Case		
	$(\nu=3.34)$			$(\nu=6)$			$(\nu=8.57)$		
	Emp	Unemp	Mig	Emp	Unemp	Mig	Emp	Unemp	Mig
Professional	-0.08	0.01	0.06	-0.10	0.01	0.09	-0.12	0.01	0.10
Technical	-1.66	0.04	1.60	-1.67	0.03	1.62	-1.67	0.02	1.64
Clerical	-1.69	0.06	1.61	-1.69	0.04	1.64	-1.69	0.03	1.65
Unskilled	-1.75	0.08	1.64	-1.75	0.05	1.68	-1.75	0.04	1.70

A.1.4. Elasticity of Labor Supply

Similarly, labor supply elasticity ν , or leisure-goods substitution elasticity in a CES sub-utility function, is a key parameter in my CGE model. I conduct a sensitivity analysis by halving and doubling the baseline parameter value of 0.25 used by McNelis et al. (2009). My simulation results are only slightly affected by these alternative assumptions. A minimum wage increase is expected to induce a fall in the supply price of labor (i.e., wages without a minimum wage premium). Although a higher labor supply elasticity leads to a larger increase in voluntary unemployment (Table A. 14), this effect,

even with doubled elasticity, is not large enough to induce significant changes in output or welfare results (Table A. 12; Table A. 13).

Table A. 12. Impacts on Output with Lower/Higher Labor Supply Elasticity Cases
[Unit: Percentage Change from the Base].

Sector	Lower Labor Supply	Baseline	Higher Labor Supply
	Elasticity Case	Case	Elasticity Case
	($v=0.125$)	($v=0.25$)	($v=0.5$)
Agriculture	-0.8	-0.8	-0.8
Other Primary	-1.1	-1.1	-1.1
Food and Beverages	-0.5	-0.5	-0.5
Manufacturing	-2.2	-2.2	-2.2
Petroleum	-0.5	-0.5	-0.5
Service	-0.3	-0.3	-0.3
Wholesale and Retail Trade	-0.5	-0.5	-0.5
Transportation	-0.3	-0.3	-0.3
Finance	-0.3	-0.3	-0.3

Table A. 13. Impacts on Household Welfare with Lower/Higher Labor Supply Elasticity Cases [Unit: EV per Capita in PHP].

Household	Lower Labor Supply		Higher Labor Supply
	Elasticity Case	Baseline Case	Elasticity Case
	($v=0.125$)	($v=0.25$)	($v=0.5$)
NCR	218.89	217.16	209.74
Luzon	59.04	59.50	59.70
Visayas	33.87	34.57	35.53
Mindanao	107.91	107.69	106.47

Table A. 14. Impacts on Domestic Employment, Unemployment, and International Migration with Lower/Higher Elasticity Cases [Unit: Changes of Employment and Unemployment in percent of Total Labor Endowment for each Labor Type].

Labor Type	Lower Labor Supply			Baseline Case			Higher Labor Supply		
	Elasticity Case ($v=0.125$)			$(v=0.25)$			Elasticity Case ($v=0.5$)		
	Emp	Unemp	Mig	Emp	Unemp	Mig	Emp	Unemp	Mig
Professional	-0.10	0.01	0.09	-0.10	0.01	0.09	-0.10	0.02	0.09
Technical	-1.67	0.02	1.63	-1.67	0.03	1.62	-1.67	0.05	1.60
Clerical	-1.70	0.02	1.65	-1.70	0.04	1.64	-1.70	0.07	1.61
Unskilled	-1.75	0.03	1.70	-1.75	0.05	1.68	-1.76	0.09	1.65

A.2. Dynamic Model Sensitivity Analyses

A.2.1. Varying Magnitude of FDI Increase

In my simulation, I assume a 40 percent increase in FDI and a two percent increase in the minimum wage. To verify the robustness of my results about this assumption, I maintain the assumption of a two percent minimum wage increase while replicating the policy experiments using lower and higher percentages of FDI increase (i.e., 20, 50, and 100 percent). The simulation findings on output (Figure A. 1), welfare (Figure A. 2), and employment (Figure A. 3) become proportionately smaller/larger with a smaller/larger shock in all indicators. These findings are qualitatively robust.

Figure A. 1. Impacts on Output with Lower/Higher FDI Percentage Increase Cases

[Deviation from the BG-BAU Level, in Percentage change].

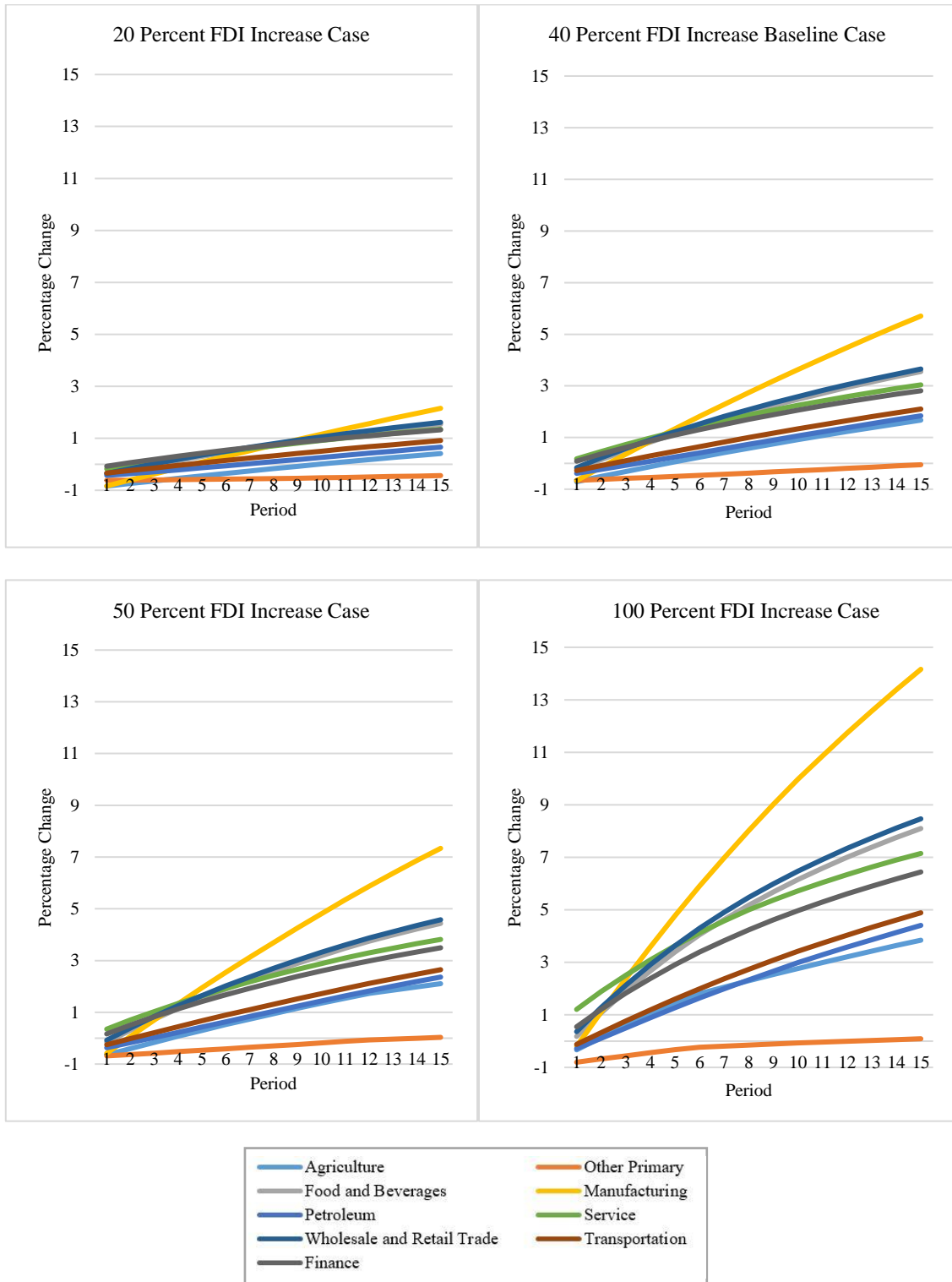
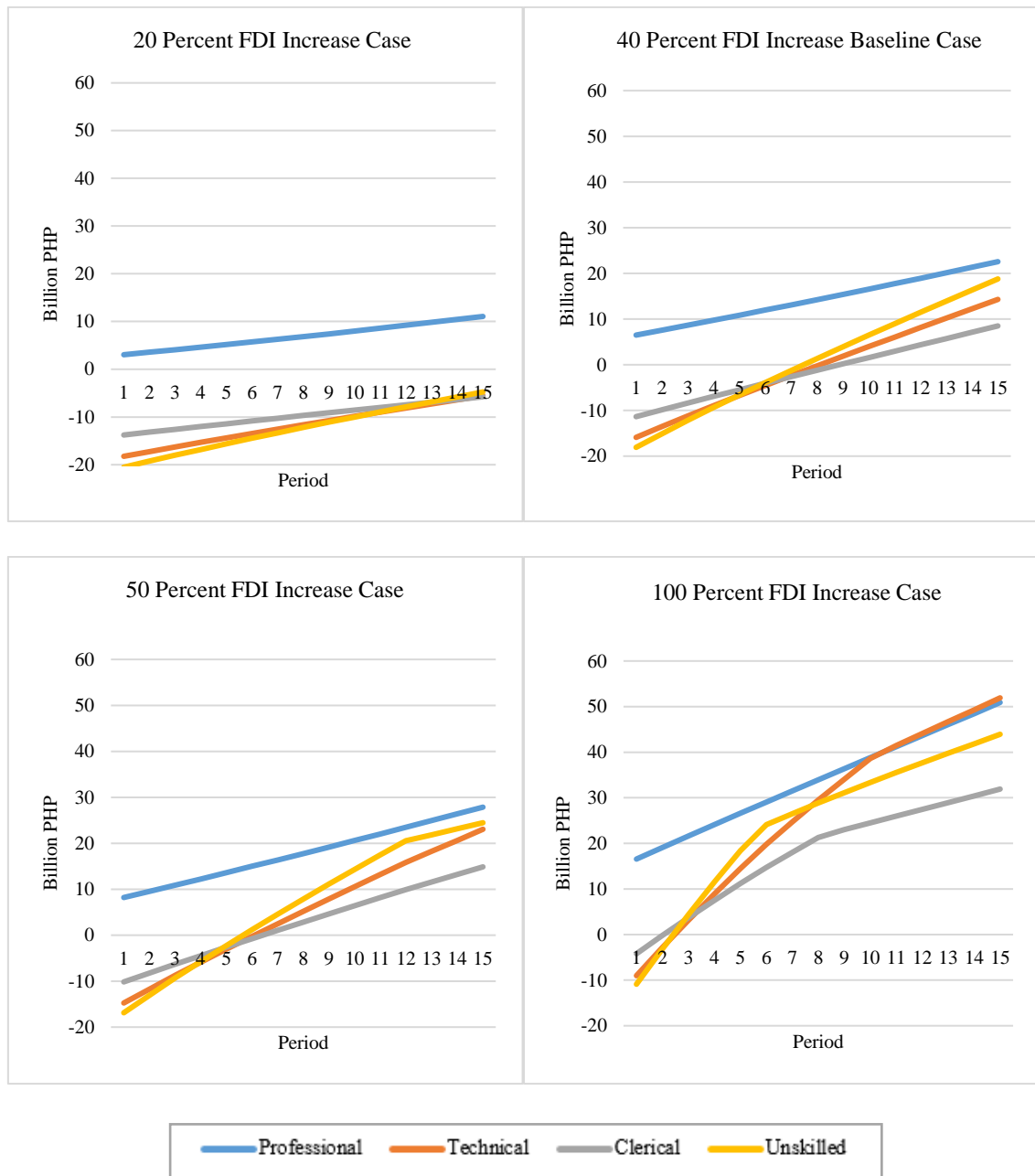


Figure A. 2. Impacts on Household Welfare with Lower/Higher FDI Percentage Increase Cases [Unit: EV per Capita in PHP].



Alternatively, the simulation results in household welfare and income below (Figure A.3) become proportionately smaller and bigger, respectively, assuming a 20 percent, 50 percent, and 100 percent FDI increase.

Figure A. 3. Impacts on Domestic Employment with Lower/Higher FDI Percentage Increase Cases [Deviation from the BG-BAU Level, Unit: Billion PHP].



A.2.2. Alternative Definition of Labor Market Segment Affected by Minimum Wage Increase

In my original scenarios in Chapter 4 and Chapter 5, I assume that the minimum wage increase affects technical, clerical, and unskilled labor, while it does not affect professional labor. In this alternative scenario, I assume more conservatively that the minimum wage increase would impact only unskilled labor among the four labor types. This assumption is based on their average monthly wage of around 11,000 PHP in 2020, which is close to the minimum wage in light of the median wage of Filipino workers (13,000–14,000 PHP) and the reported minimum wage bite (PSA, 2019, 2020c).

A.2.2.1. Effects on Domestic Employment and Migration

The outcomes on domestic employment, international migration, output, and domestic capital in this alternative scenario are comparable to my findings in Chapter 5. Figure A. 4 shows the impact on domestic employment in the four types of labor markets. In the short run, I observe that unskilled workers would lose their jobs due to the minimum wage increase and recover faster (after 6 to 7 periods) due to the job creation effects of the FDI increase in the long run. Long-run demand for unskilled labor would eventually surpass that of clerical labor due to the emergence of the agriculture sector as it gains a large amount of domestic capital (Figure A. 7).

The demand for professional, technical, and clerical labor stems from the service and manufacturing sectors, while the demand for unskilled labor is driven by the agriculture sector followed by the service and wholesale and retail trade sectors (Figure A. 5). I again observe the largest increase in output in these three sectors (manufacturing,

service, and wholesale and retail trade) (Figure A. 6), which is expected of the main FDI-host sectors. On the other hand, the growth of the agriculture sector is still attributed to the reallocation of domestic capital from the FDI-host sectors to the agriculture sector.

Figure A. 4. Impacts on Domestic Employment due a Two Percent Minimum Wage Increase in Unskilled Labor Market and a 40 Percent FDI Increase [Deviation from the BG-BAU Level, Unit: Billion PHP].

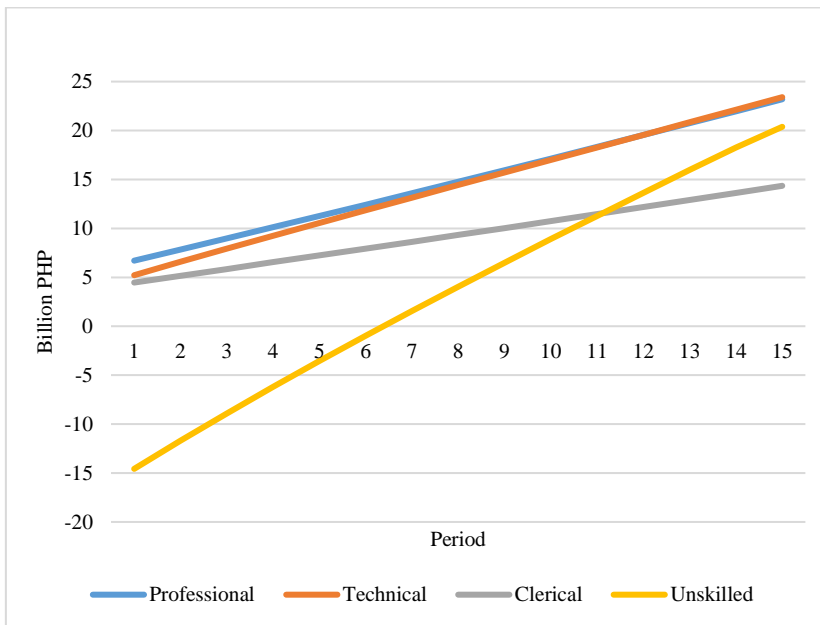


Figure A. 5. Impacts on the Demand for Labor due a Two Percent Minimum Wage Increase in Unskilled Labor Market and a 40 Percent FDI Increase [Deviation from the BG-BAU Level, Unit: Billion PHP].

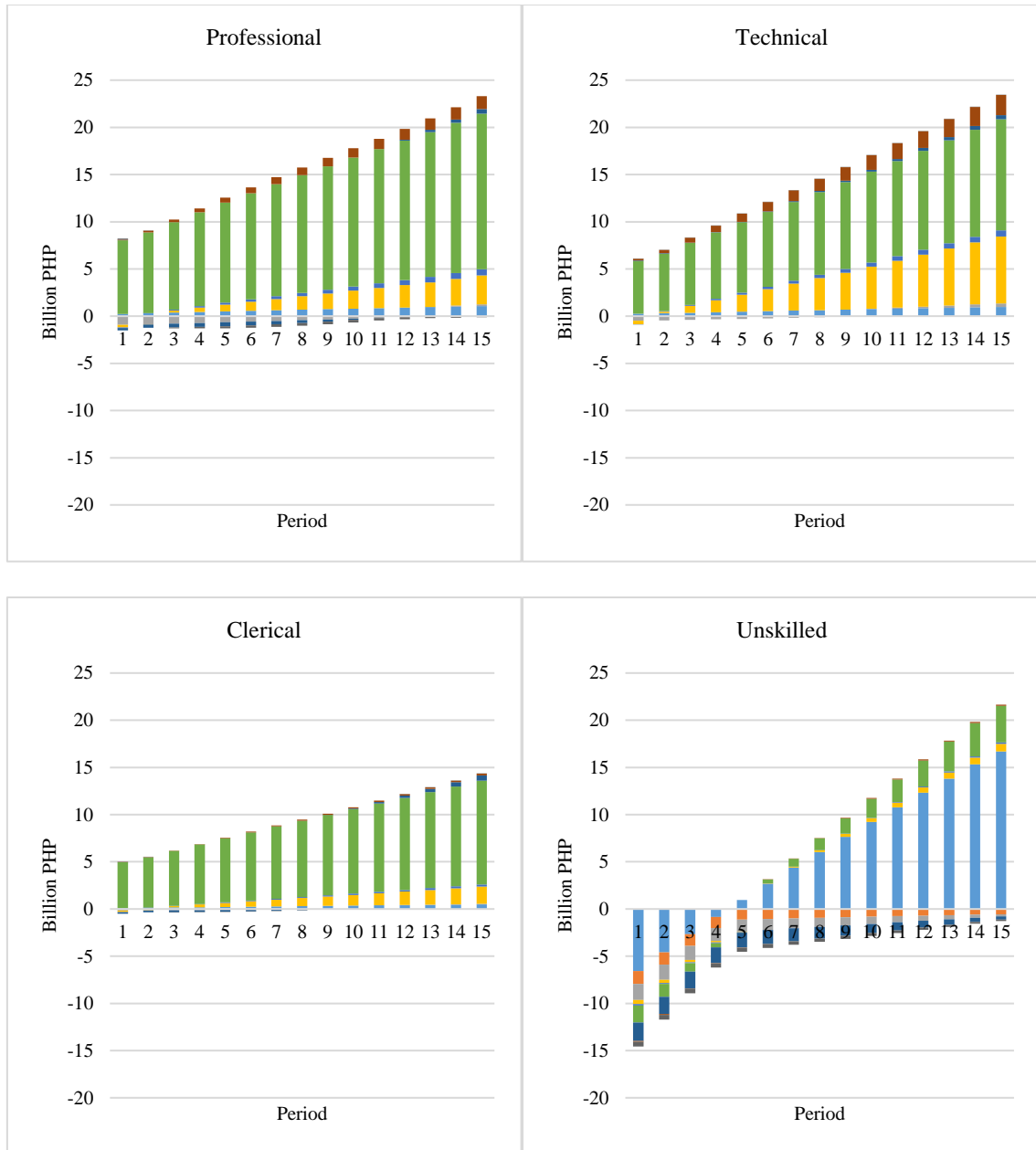


Figure A. 6. Impacts on Output due a Two Percent Minimum Wage Increase in Unskilled Labor Market and a 40 Percent FDI Increase [Deviation from the BG-BAU Level, in Percentage Change].

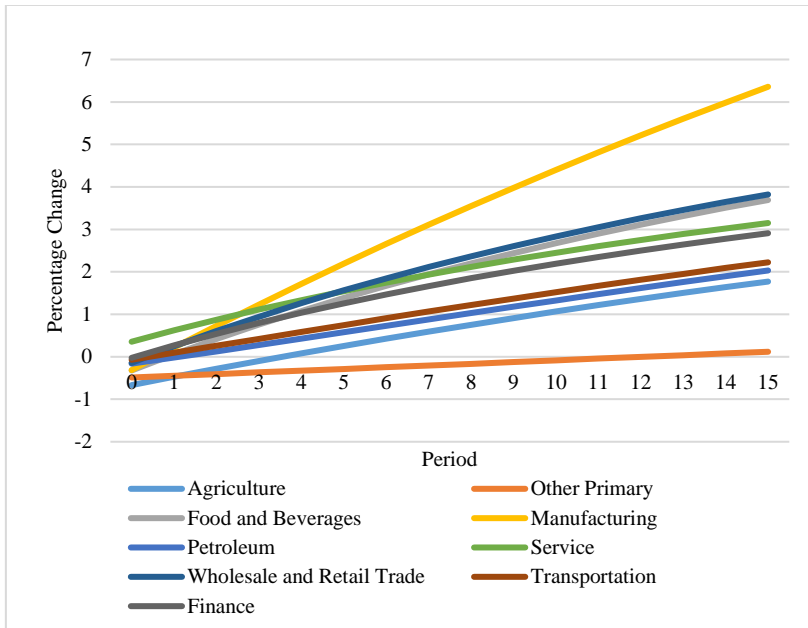
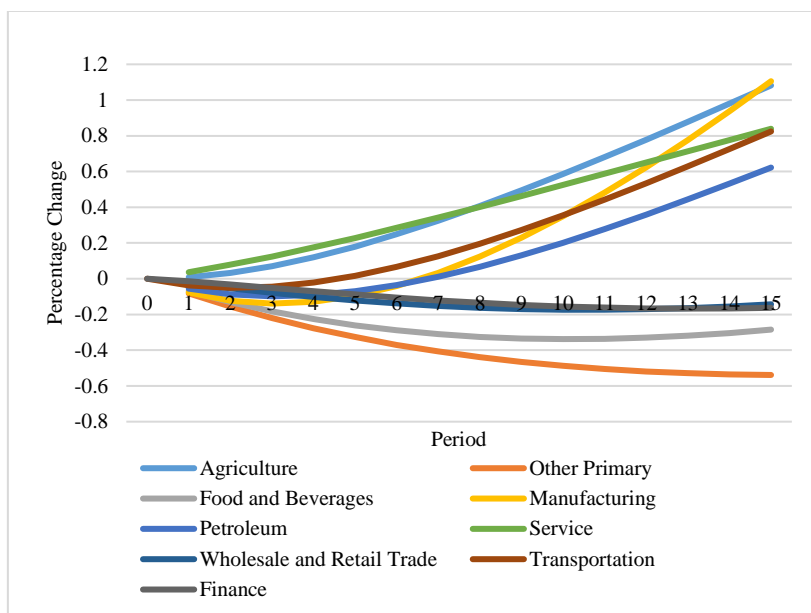


Figure A. 7. Impacts on Domestic Capital due a Two Percent Minimum Wage Increase in Unskilled Labor Market and a 40 Percent FDI Increase [Deviation from the BG-BAU Level, in Percentage Change].



A.2.2.2. Effects on Household Welfare and Inequality

The analyses of welfare and inequality in my alternative setup are similar to my Chapter 5 results. Welfare also increases for all types of households due to positive income changes brought about by domestic capital and labor incomes (Figure A. 8), while the inequality incidence is still unchanged because the Gini coefficient does not change much from 0.703892 to 0.703879. However, compared to my findings in Chapter 5, I find that the role of remittance income is diminished due to lower outward migration activity with only the unskilled workers sending remittances from abroad (Figure A. 9).

Figure A. 8. Equivalent Variation per Capita due a Two Percent Minimum Wage Increase in Unskilled Labor Market and a 40 Percent FDI Increase [Unit: PHP].

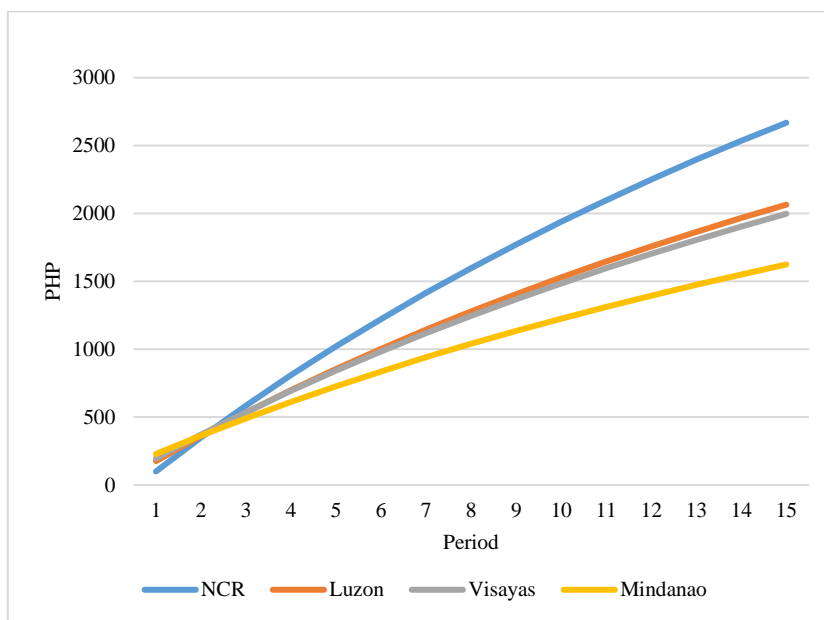
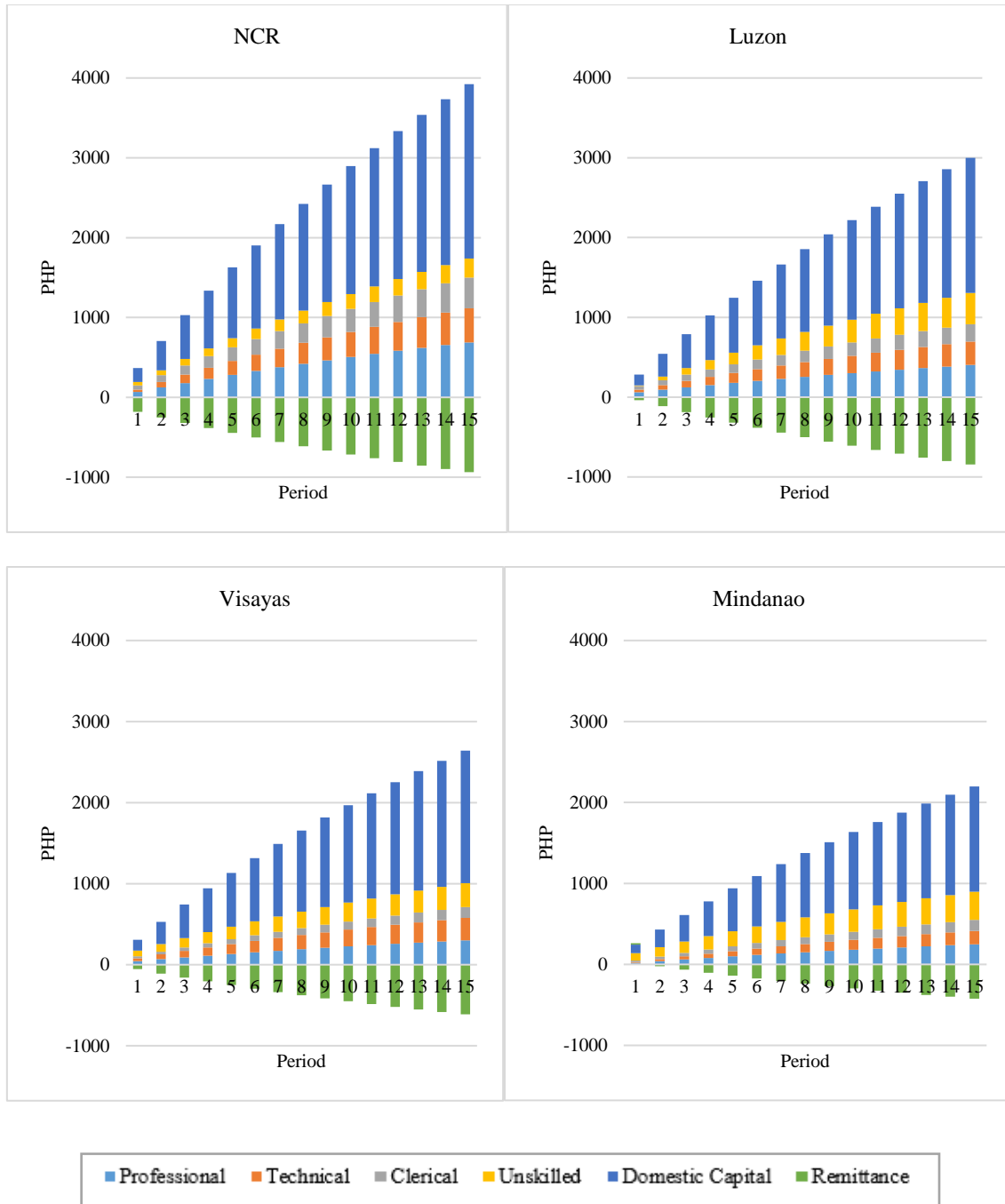


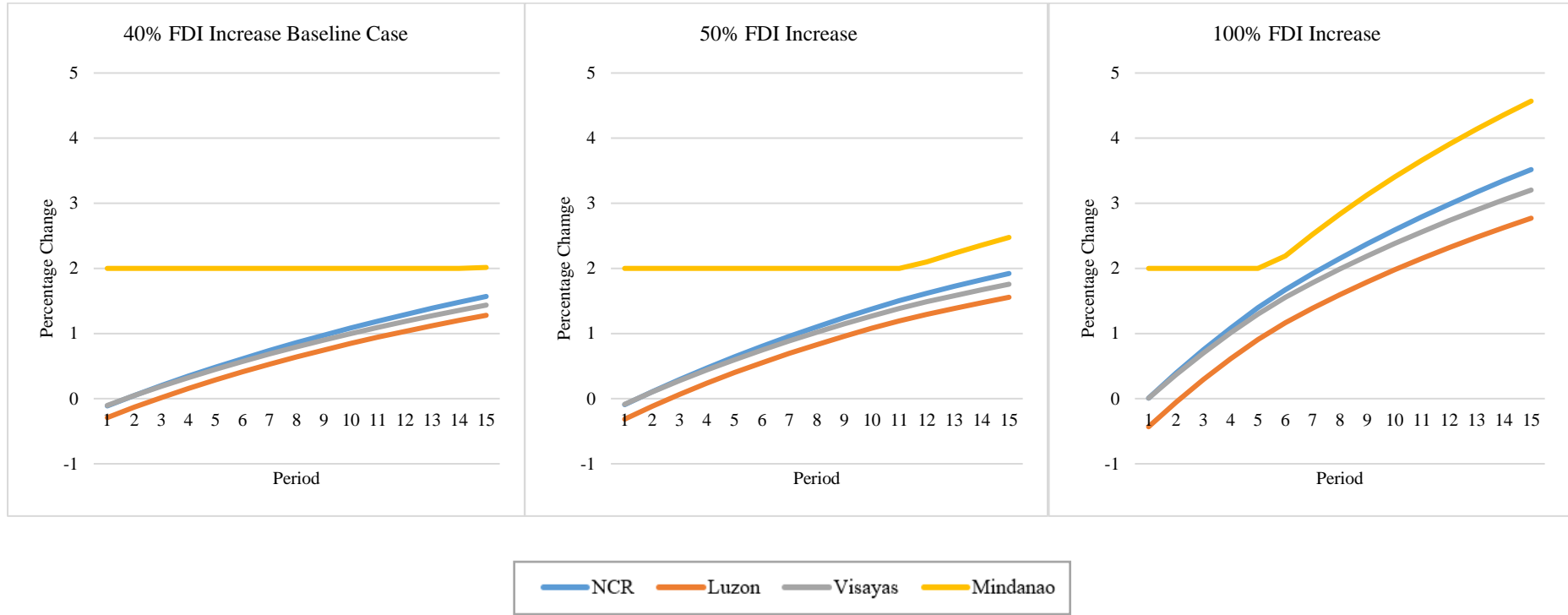
Figure A. 9. Impacts on Household per Capita Income by Source of Income due to a Two Percent Minimum Wage Increase in Unskilled Labor Market and a 40 Percent FDI Increase [Deviations from the BG-BAU Level, Unit: PHP].



A.2.2.3. Effects on Wage Rates due to an Accelerated FDI Increase

Replicating my approach in Chapter 5, I accelerate the FDI increase by 50 and 100 percent along with a minimum wage increase directed only to the unskilled labor market. Figure A.10 implies that the minimum wage constraint would become non-binding for unskilled workers after 11 periods with a 50 percent FDI increase, while it would further expedite the process to 5 periods with a 100 percent FDI increase. Higher wages of unskilled workers are mainly driven by unskilled labor employment generated by large FDI inflows.

Figure A. 10. Impacts on Wage Rates due to an Accelerated FDI Increase of 50 and 100 Percent and a Two Percent Minimum Wage Increase in Unskilled Labor Market [Deviation from the BG-BAU Level, in Percentage Change].



A.2.3. Armington Elasticity

The Armington elasticity indicates the ease of substitution between domestic goods and imported goods. To test the robustness of my simulation results, I perform a sensitivity analysis with a 50 percent lower elasticity value and a 50 percent higher elasticity value than the baseline case. The findings below are similar with the static model findings, where a higher Armington elasticity leads to marginally higher output (Figure A.11), welfare (Figure A. 12), and domestic employment (Figure A. 13).

Figure A. 11. Impacts on Output with 50 Percent Lower/Higher Elasticity Cases [Deviation from the BG-BAU Level, in Percentage Change].

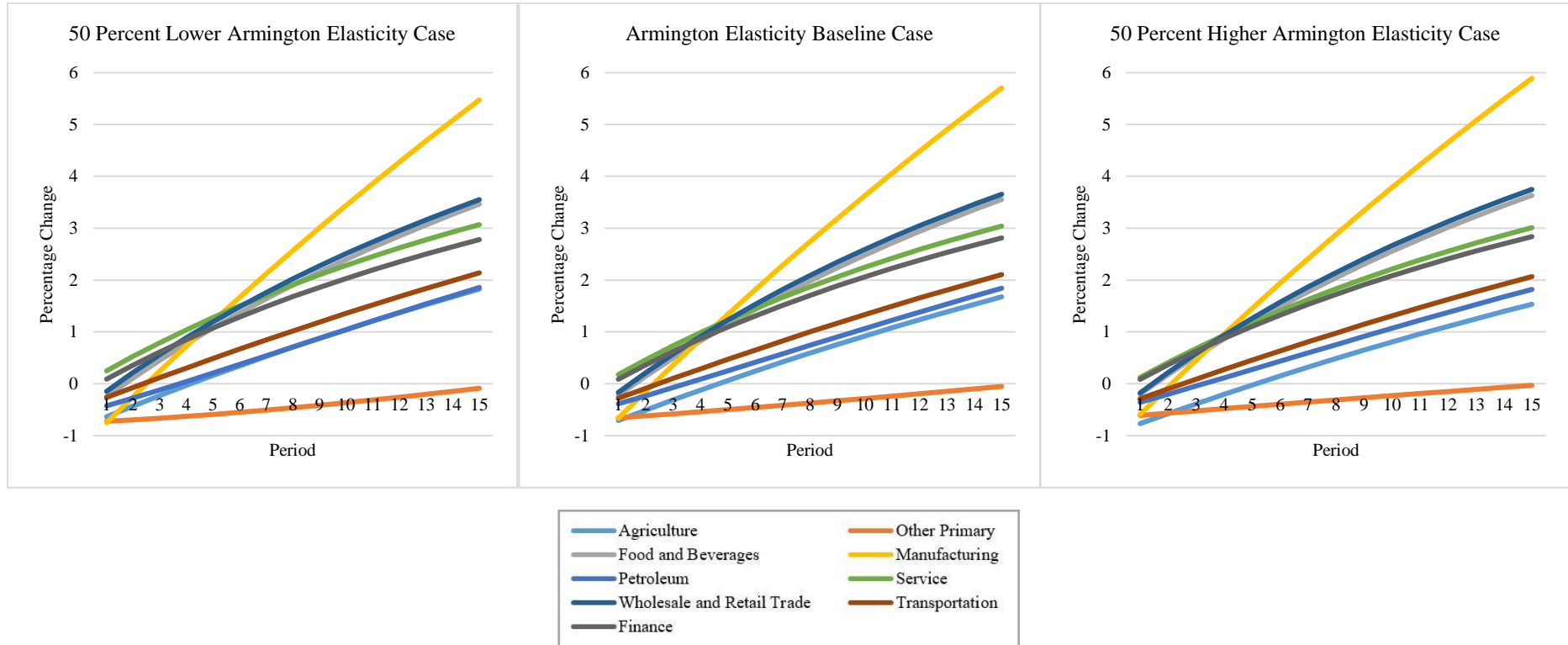


Figure A. 12. Impacts on Household Welfare with 50 Percent Lower/Higher Elasticity Cases [Unit: EV per Capita in PHP].

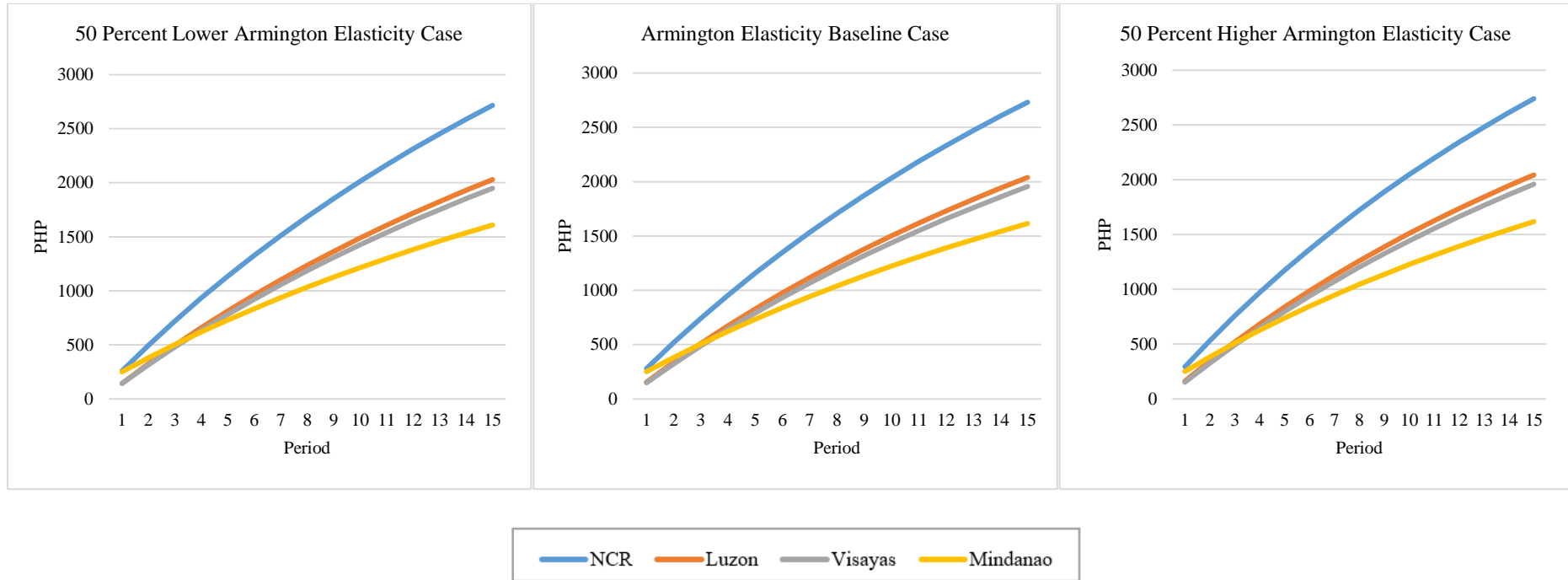
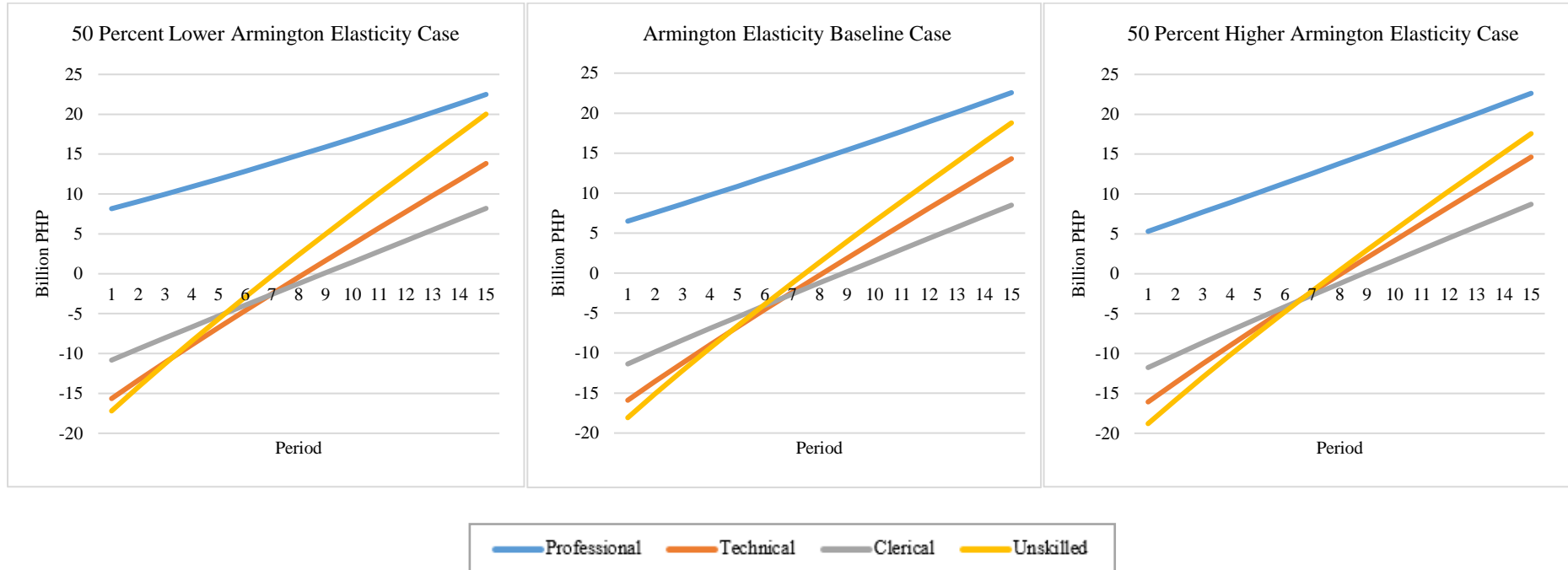


Figure A. 13. Impacts on Domestic Employment with 50 Percent Lower/Higher Elasticity Cases [Deviation from the BG-BAU Level, Unit: Billion PHP].



A.2.4. Elasticity of Transformation between Domestic-Foreign Labor

Market Allocation

The elasticity of transformation indicates the sensitivity of labor allocation between domestic and foreign markets. Similar with the static model, I adopt the lower and upper bound elasticity values of Bertoli et al. (2016) to be used for my sensitivity analysis in the dynamic model. With higher elasticity of transformation, output (Figure A.14), welfare (Figure A. 15), and domestic employment (Figure A. 16) are only marginally increased.

Figure A. 14. Impacts on Output with Lower/Higher Elasticity Cases [Deviation from the BG-BAU Level, in Percentage Change].

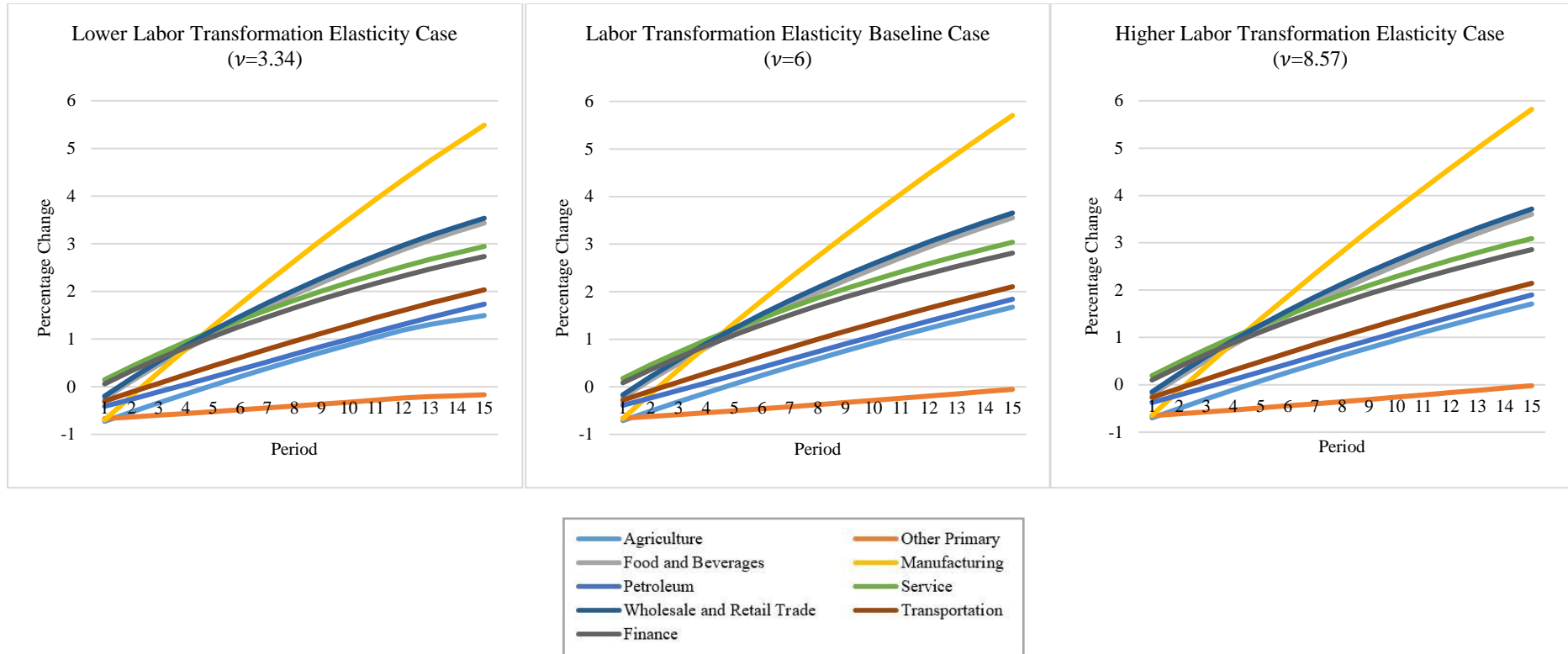


Figure A. 15. Impacts on Household Welfare with Lower/Higher Elasticity Cases [Unit: EV per Capita in PHP].

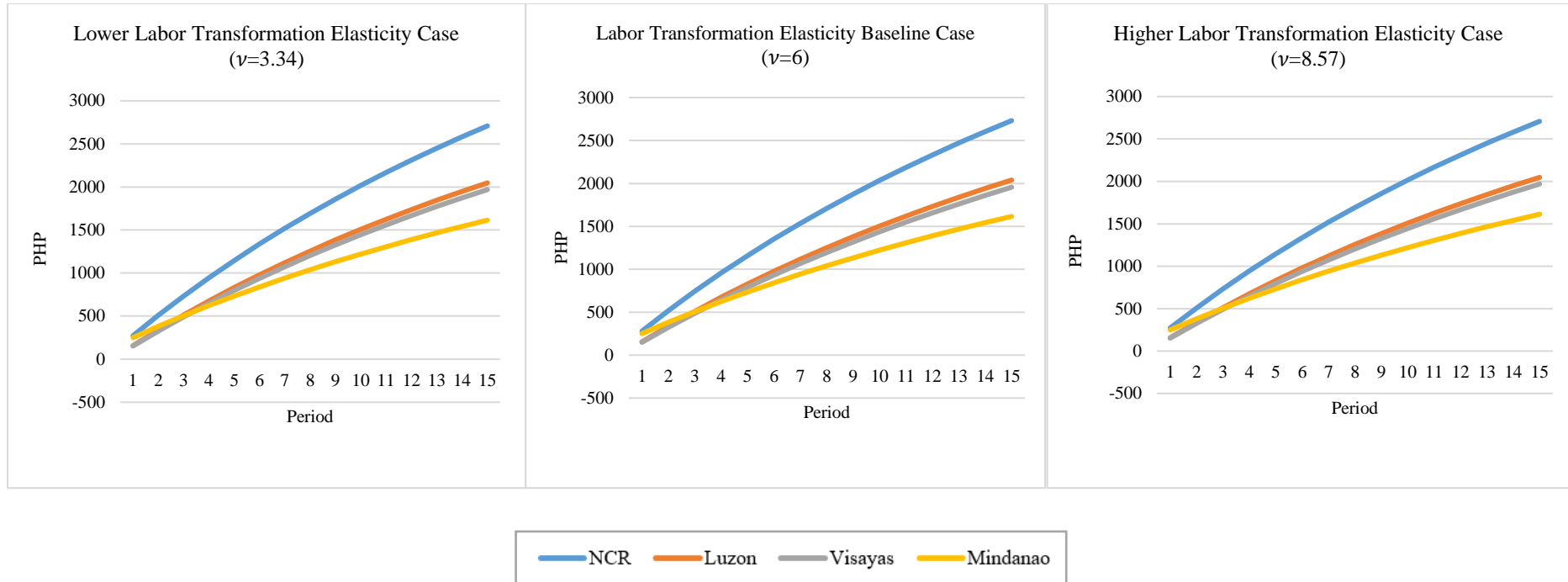
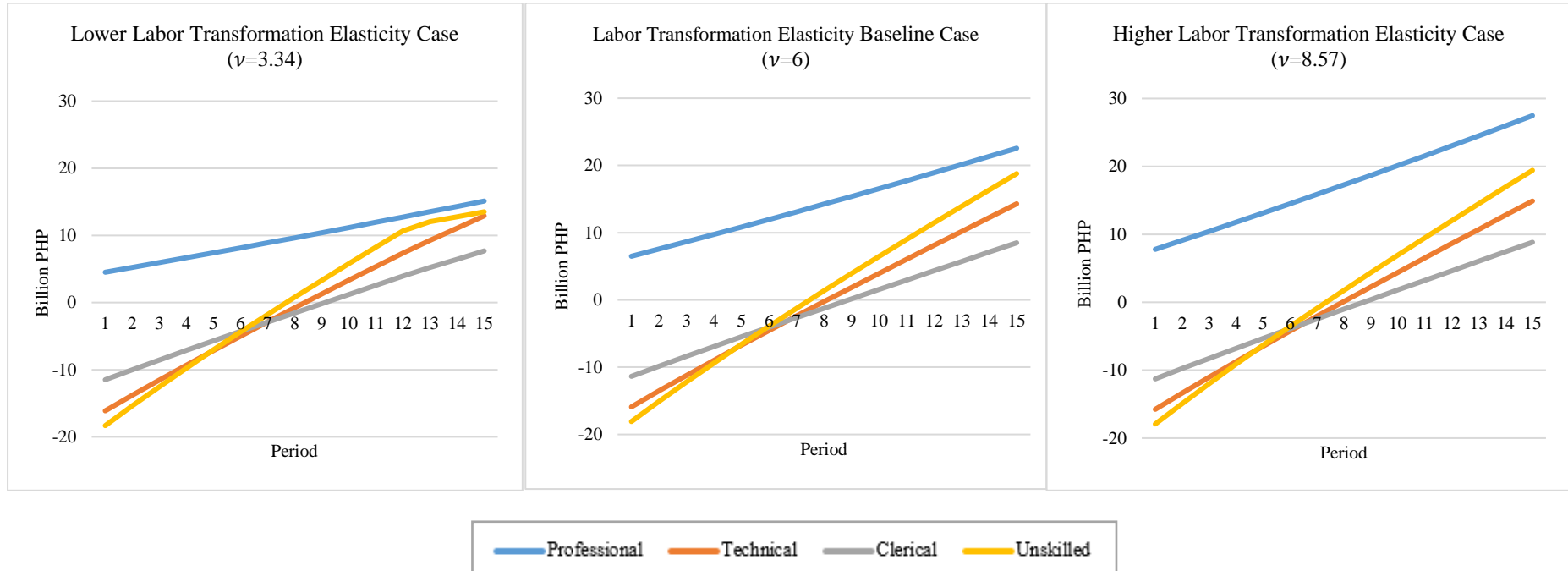


Figure A. 16. Impacts on Domestic Employment with Lower/Higher Elasticity Cases [Deviation from the BG-BAU Level, Unit: Billion PHP].



A.2.5. Elasticity of Labor Supply

The labor supply elasticity denotes the ease of substitution between consuming goods and leisure in a CES sub-utility function. Similar with the static model sensitivity analysis, I refer to McNelis et al. (2009) for the assumed parameter of 0.25, and I halve/double this parameter to determine the upper and lower bound of the lower and higher elasticity cases. Given a higher labor supply elasticity, output (Figure A.17) and domestic employment (Figure A. 19) are slightly increased, while welfare is slightly decreased (Figure A. 18).

Figure A. 17. Impacts on Output with Lower/Higher Labor Supply Elasticity Cases [Deviation from the BG-BAU Level, in Percentage Change].

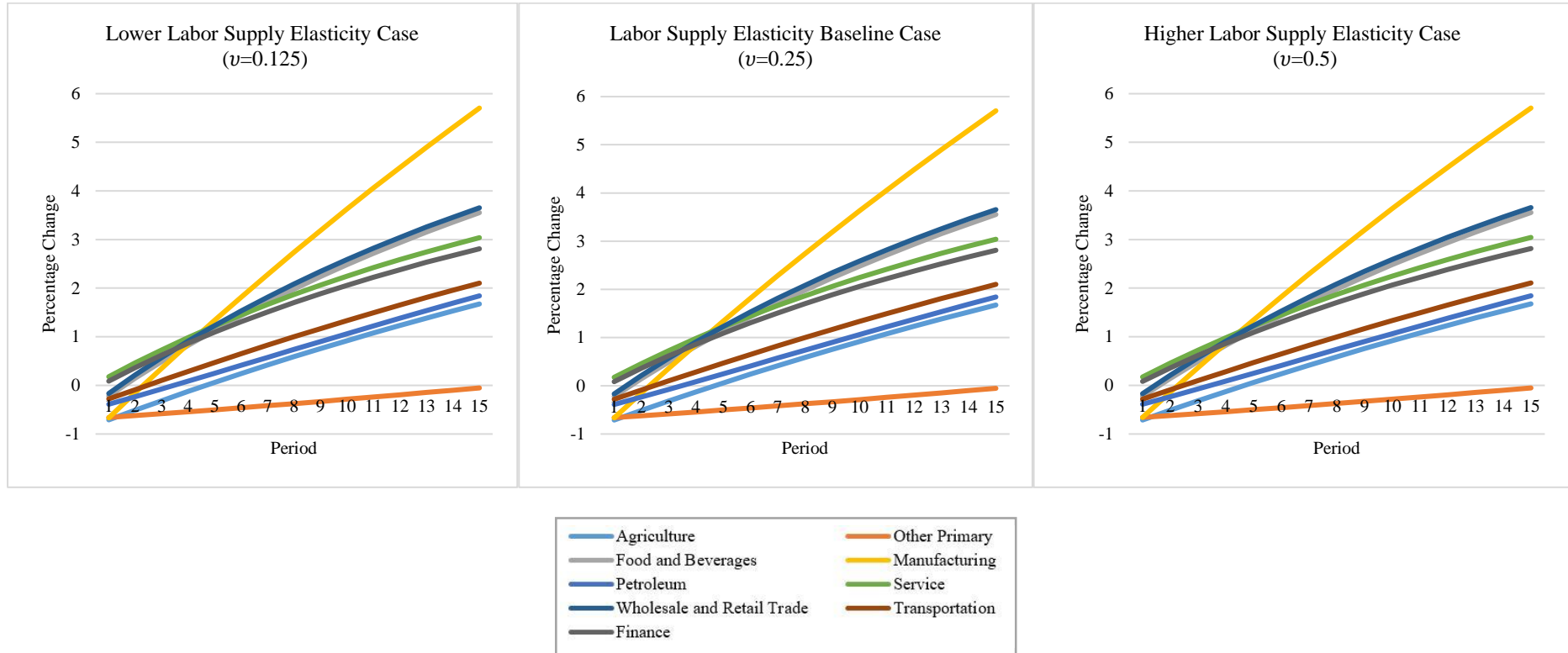


Figure A. 18. Impacts on Household Welfare with Lower/Higher Labor Supply Elasticity Cases [Unit: EV per Capita in PHP].

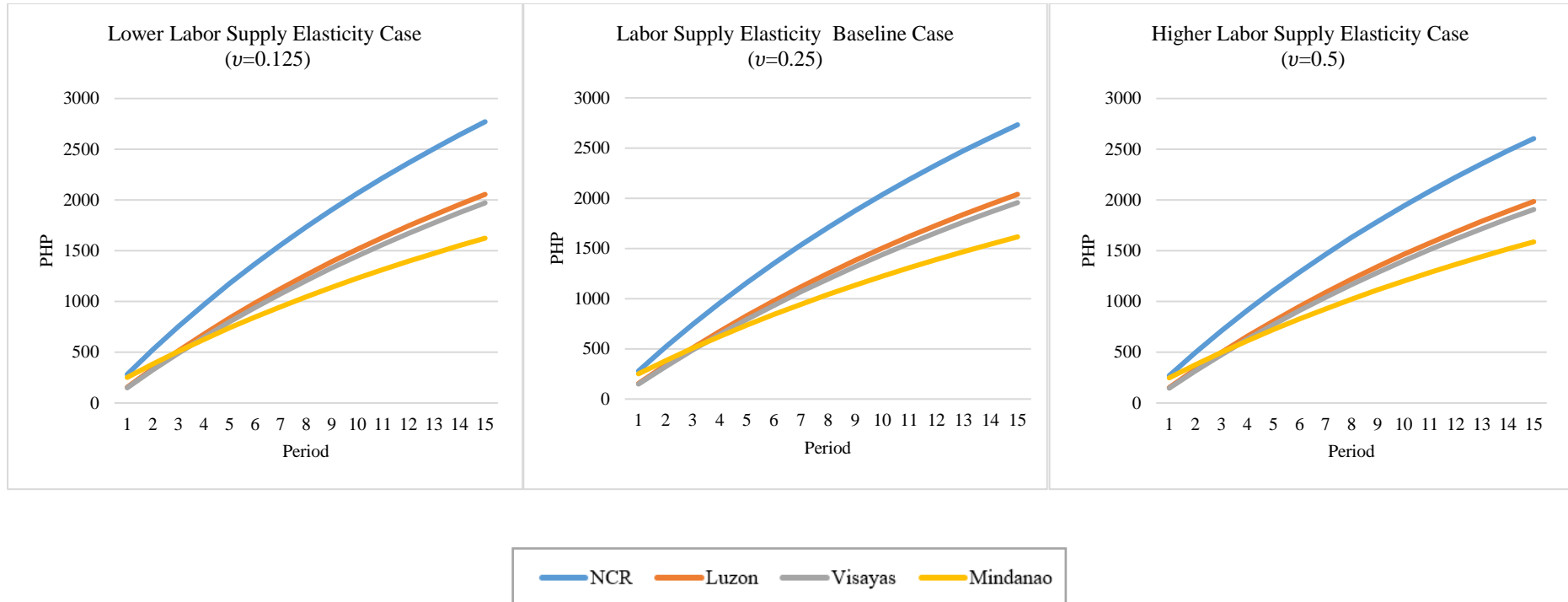
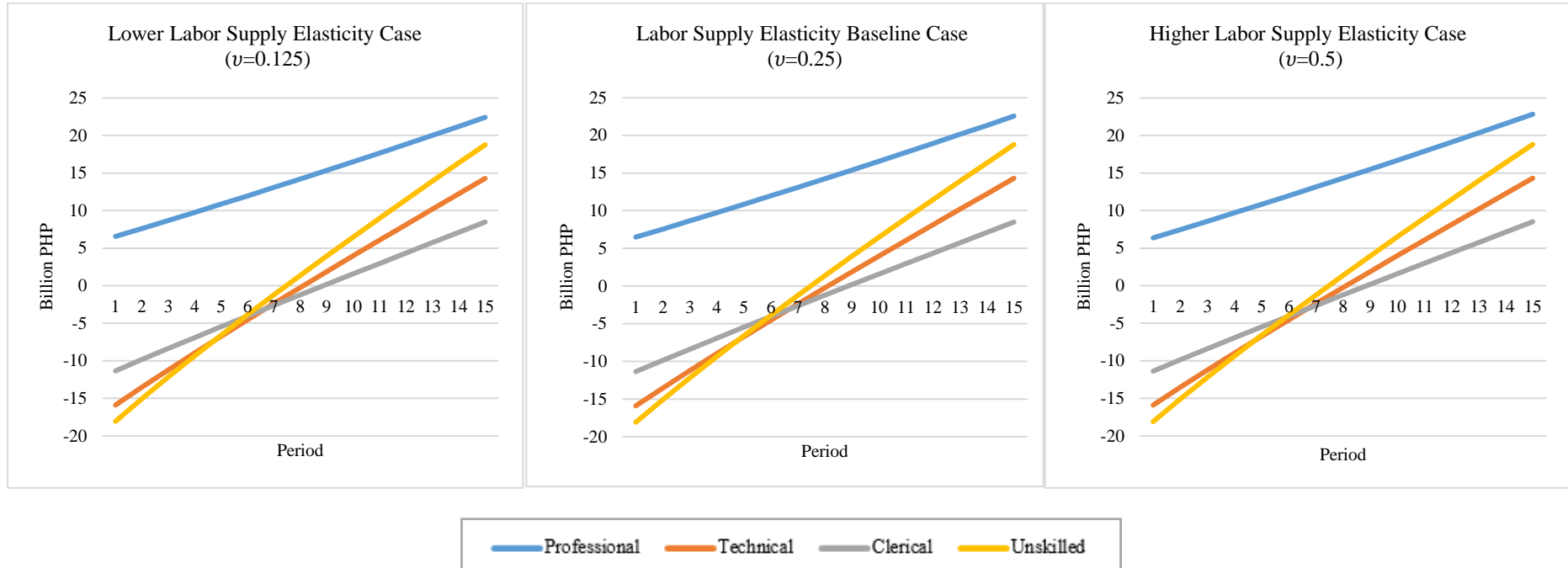


Figure A. 19. Impacts on Domestic Employment with Lower/Higher Elasticity Cases [Deviation from the BG-BAU Level, Unit: Billion PHP].



A.2.6. Population Growth Rate

In the dynamic model, the BG-BAU path shows how much endogenous variables are expected to grow over time using the population growth rate. To test the robustness of my simulation results based on the average population growth rate of 1.72 percent reported by the PSA during the period 2010–2015, I conduct a sensitivity analysis with a lower population growth rate of 0.9 percent and a higher population growth rate of 2.4 percent. Assuming a higher population growth rate results in higher output (Figure A. 20), welfare (Figure A. 21), and domestic employment (Figure A. 22).

Figure A. 20. Impacts on Output with Lower/Higher Population Growth Rate Cases [Deviation from the BG-BAU Level, in Percentage Change].

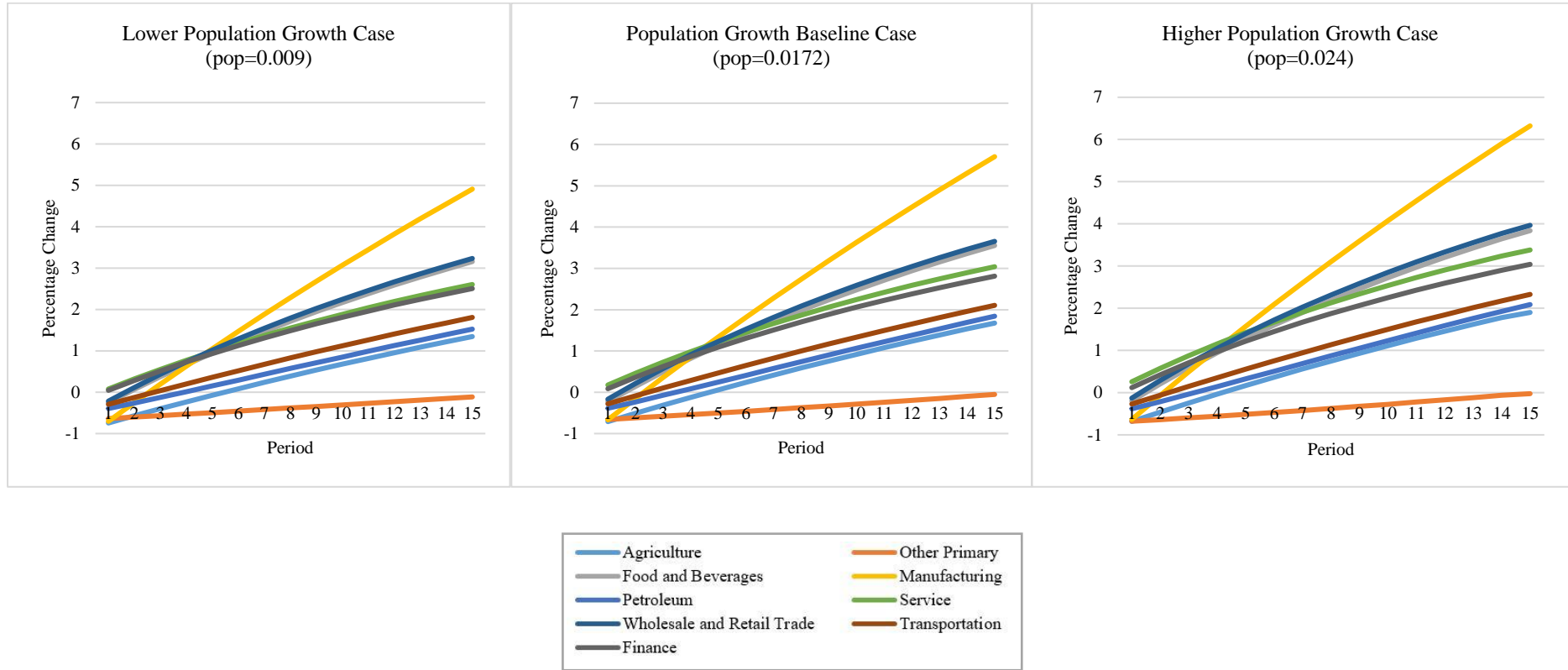


Figure A. 21. Impacts on Household Welfare with Lower/Higher Population Growth Rate Cases [Unit: EV per Capita in PHP].

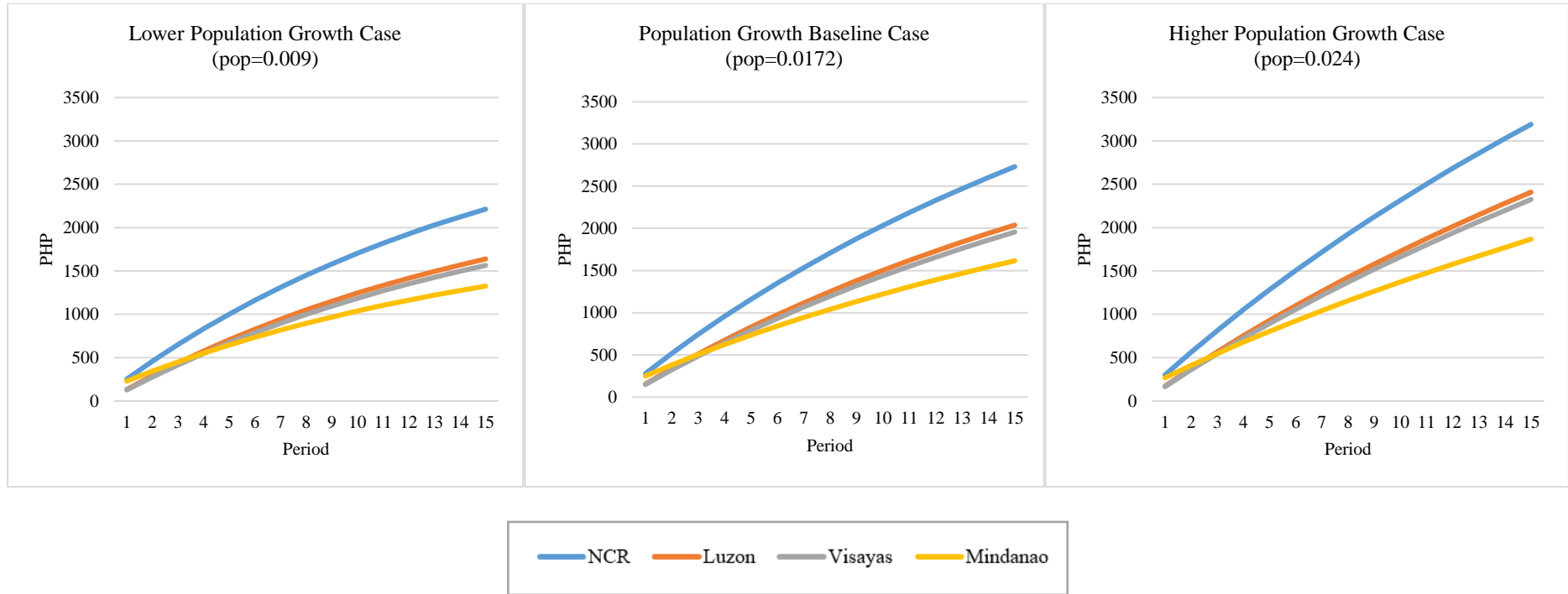
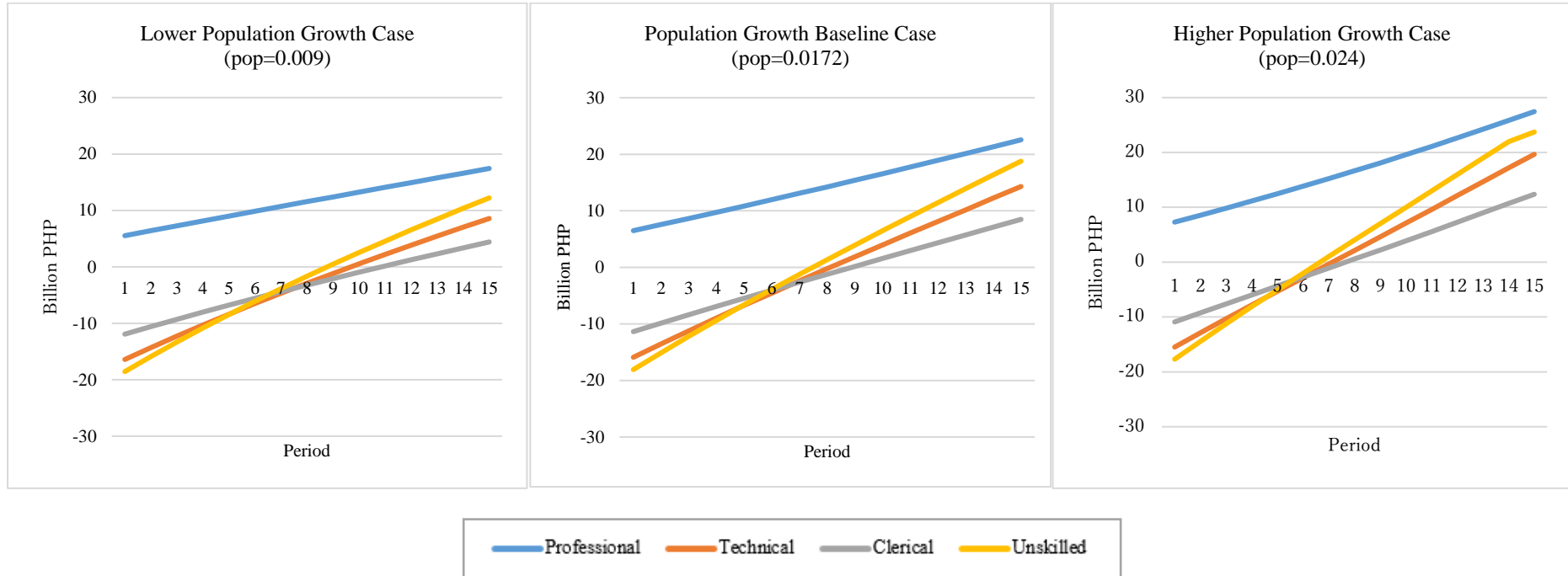


Figure A. 22. Impacts on Domestic Employment with Lower/Higher Population Growth Rate Cases [Deviation from the BG-BAU Level, Unit: Billion PHP].



A.2.7. Sectoral Investment Allocation Parameter

In the dynamic model, the sectoral investment allocation parameter reflects the weight given to intersectoral variations of the rate of returns. A larger weight or elasticity denotes a more sensitive allocation of investment goods in response to these rate of return variations among sectors caused by shocks. In my sensitivity analysis, I find that a higher investment allocation parameter only has marginal impacts on output (Figure A.23), welfare (Figure A. 24), and domestic employment (Figure A. 25). Larger elasticity allows for quicker reallocation of capital among sectors. This effect is given to all sectors by and large equally. Thus, I obtain qualitatively similar trends of output changes and other indicators affected by the output changes.

Figure A. 23. Impacts on Output with Lower/Higher Investment Allocation Parameter Cases [Deviation from the BG-BAU Level, in Percentage Change].

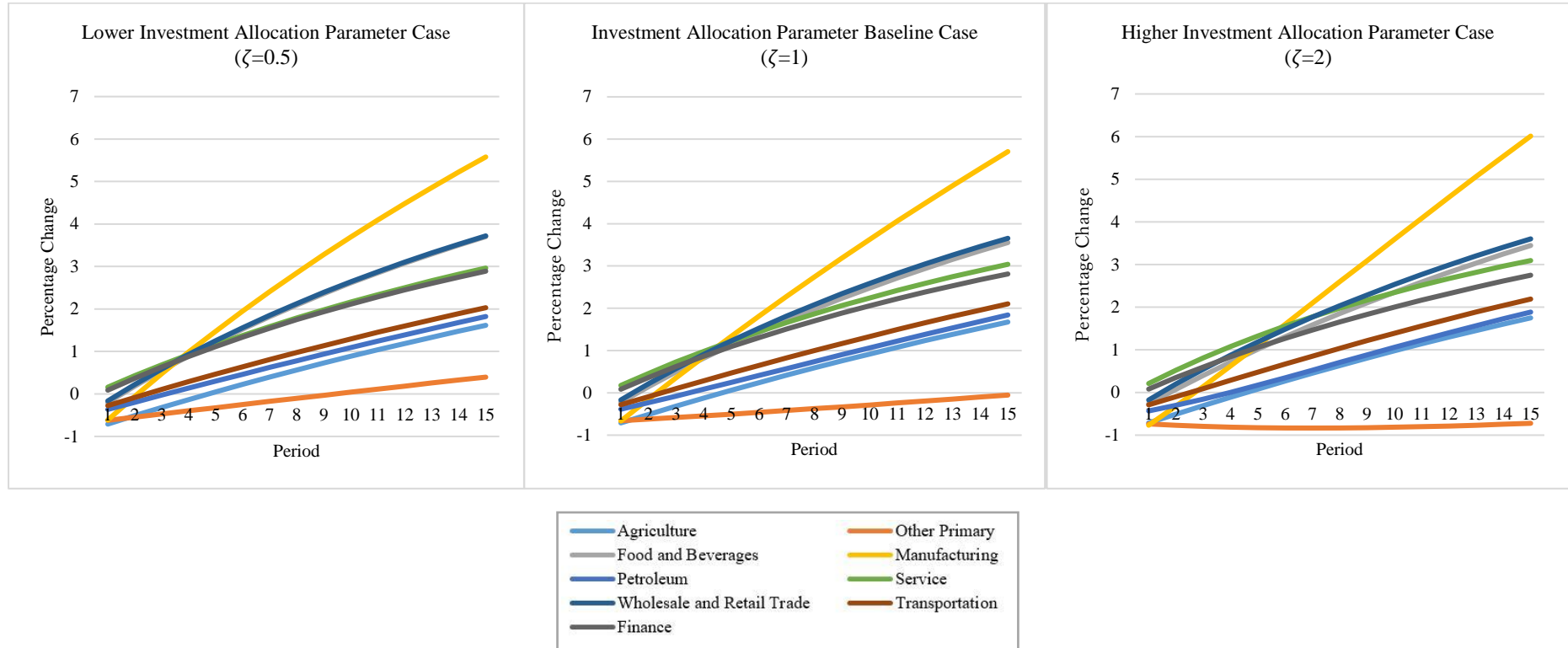


Figure A. 24. Impacts on Household Welfare with Lower/Higher Investment Allocation Parameter Cases [Unit: EV per Capita in PHP].

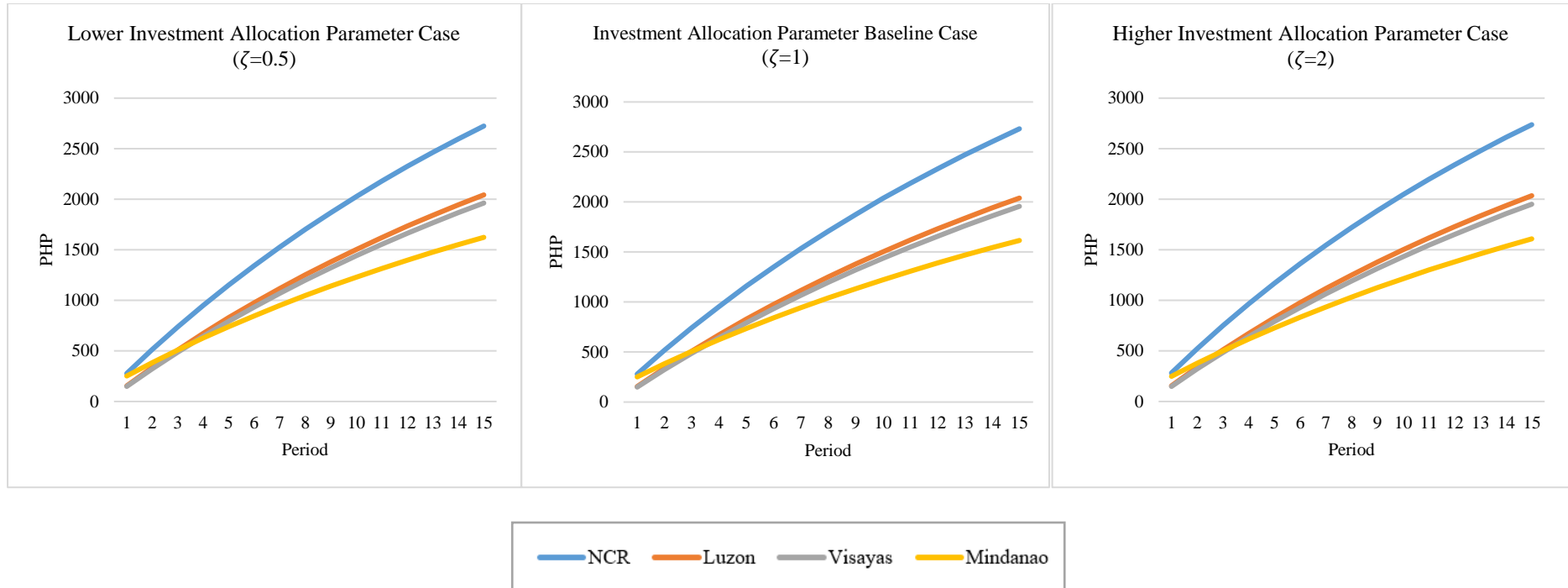
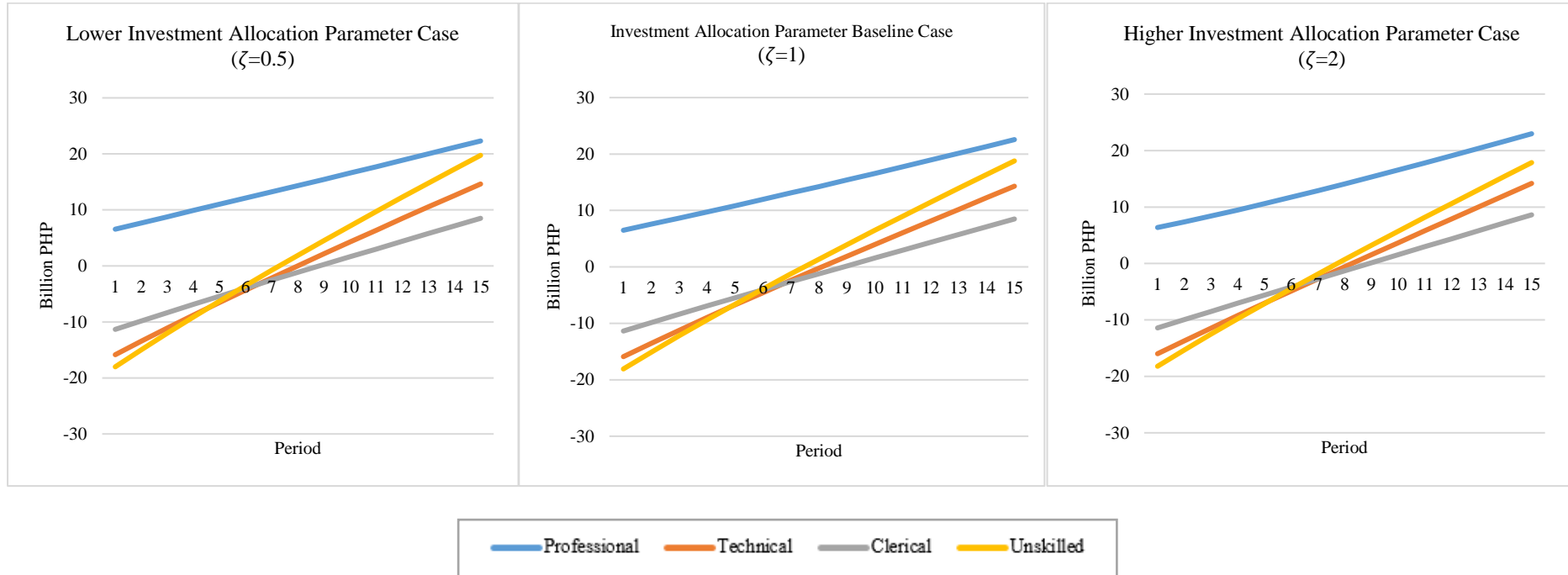


Figure A. 25. Impacts on Domestic Employment with Lower/Higher Investment Allocation Parameter Cases [Deviation from the BG-BAU Level, Unit: Billion PHP].



A.3. Supplemental Table and Figures

A.3.1. Aggregation of the Social Accounting Matrix

Table A. 15. Mapping between the Disaggregated SAM and Aggregated SAM.

Sectors	Description of Elements
Agriculture	Palay, Corn, Coconut, Sugarcane, Banana, Other crops, Livestock, Poultry, Agricultural activities and services
Other Primary	Forestry, Fishery, Gold mining, Copper mining, Chromite mining, Nickel mining, Other metallic mining, Other mining and quarrying
Food and Beverages	Food manufactures, Beverage industries, Tobacco manufactures
Manufacturing	Textile manufactures, Wearing apparel, Footwear and leather and leather products, Wood, bamboo, cane and rattan articles, Paper and paper products, Printing and reproduction of recorded media, Non-metallic mineral products, Basic metal industries, Fabricated metal products, Computer, electronic and optical products, Electrical equipment, Machinery and equipment except electrical, Transport equipment, Furniture and fixtures, Miscellaneous manufactures
Petroleum	Petroleum and other fuel products, Chemical and chemical products, Basic pharmaceutical products and pharmaceutical preparations, Rubber and plastic products
Service	Electricity, Steam, Water, Sewerage and waste water remediation activities, Construction, Postal and courier activities, Publishing and information, Communication, Real estate activities, Ownership of

	dwellings, Professional, scientific and technical activities, Administrative and support service activities, Public administration and defense, Compulsory social security, Accommodation and food service activities, Education, Human health and social work activities, Arts, entertainment and recreation, Other service activities
Wholesale and Retail Trade	Wholesale and retail trade, Maintenance and repair of motor vehicles
Transportation	Land transport, Water transport, Air transport, Warehousing and support activities for transportation
Finance	Banking institutions, Non-bank financial intermediation, Insurance and activities auxiliary to financial intermediation

Source: Philippine Statistics Authority

A.3.2. Aggregated Social Accounting Matrix of the Philippines [Unit: Million PHP].

	Agriculture	Other Primary	Food	Manufacturing	Petroleum	Service	Wholesale	Transportation	Finance	Professional	Technical	Clerical	Unskilled
Agriculture	218,438.4	25,518.14	630,092.7	60,278.10	18,420.83	147,193.21	40,538.59	5,641.58	5,370.1	-	-	-	-
Other Primary	6,718.68	15,271.22	11,570.61	129,168.25	211,407.5	77,908.67	13,738.13	429.36	891.66	-	-	-	-
Food	69,619.61	13,240.45	516,446.8	291,191.60	81,238.75	270,980.57	173,059.2	14,363.68	10,611.	-	-	-	-
Manufacturing	12,414.09	1,669.07	62,592.94	489,141.74	29,238.35	446,770.86	165,042.9	14,200.09	13,492.	-	-	-	-
Petroleum	31,891.89	9,909.45	52,709.38	121,040.64	159,775.6	231,758.68	99,949.39	159,473.91	16,351.	-	-	-	-
Service	53,039.32	31,358.98	254,771.7	135,751.09	52,353.08	1,107,158.6	292,124.3	76,681.86	113,49	-	-	-	-
Wholesale	133,369.7	41,075.21	256,801.4	305,497.17	121,056.4	782,603.38	468,050.2	98,411.56	121,69	-	-	-	-
Transportation	12,514.08	1,487.17	70,050.55	55,765.66	39,909.52	78,894.02	83,141.68	83,353.35	14,151.	-	-	-	-
Finance	7,808.06	9,083.19	19,199.16	63,653.10	20,148.74	258,693.45	196,718.4	59,926.58	306,64	-	-	-	-
Professional	27,897.08	5,762.88	113,917.5	56,401.10	21,931.54	646,257.90	267,174.8	40,454.62	170,55	-	-	-	-
Technical	23,514.79	10,878.62	68,674.47	121,397.23	19,066.01	402,255.91	82,668.73	56,502.40	760.74	-	-	-	-
Clerical	12,064.41	1,864.67	17,819.30	32,741.22	6,926.22	403,676.85	156,201.3	5,105.35	26,975.	-	-	-	-
Unskilled	518,802.4	44,434.82	59,895.22	16,718.47	6,278.99	195,257.21	87,886.94	5,006.37	24,852.	-	-	-	-
Domestic Capital	658,124.6	261,089.7	585,434.2	367,589.61	187,882.9	1,956,675.1	656,460.9	243,688.97	441,16	-	-	-	-
Foreign Capital	0	11,711.47	196,535.5	149,334.00	12,911.09	344,836.03	287,064.2	14,703.12	115,85	-	-	-	-
Professional Migrant	-	-	-	-	-	-	-	-	-	-	-	-	-
Technical Migrant	-	-	-	-	-	-	-	-	-	-	-	-	-
Clerical Migrant	-	-	-	-	-	-	-	-	-	-	-	-	-
Unskilled Migrant	-	-	-	-	-	-	-	-	-	-	-	-	-
IDT	43,085.09	14,837.75	44,032.36	15,769.70	6,768.40	108,422.51	95,739.83	25,420.94	71,092.	-	-	-	-
NCR	-	-	-	-	-	-	-	-	-	372,769.71	187,310.6	203,865.0	91,556.61
Luzon	-	-	-	-	-	-	-	-	-	539,158.76	341,414.3	253,552.7	426,279.3
Visayas	-	-	-	-	-	-	-	-	-	184,929.01	120,432.4	89,132.24	179,712.5
Mindanao	-	-	-	-	-	-	-	-	-	253,496.91	136,561.5	116,825.2	261,584.6
GOV	-	-	-	-	-	-	-	-	-	-	-	-	-
INV	-	-	-	-	-	-	-	-	-	-	-	-	-
EXT	105,177.8	296,378.4	602,117.5	1,255,162.74	518,559.6	500,758.65	144,479.2	109,444.85	46,016.	-	-	-	-

Source: Philippine Statistics Authority

A.3.2. Aggregated Social Accounting Matrix of the Philippines [Continued].

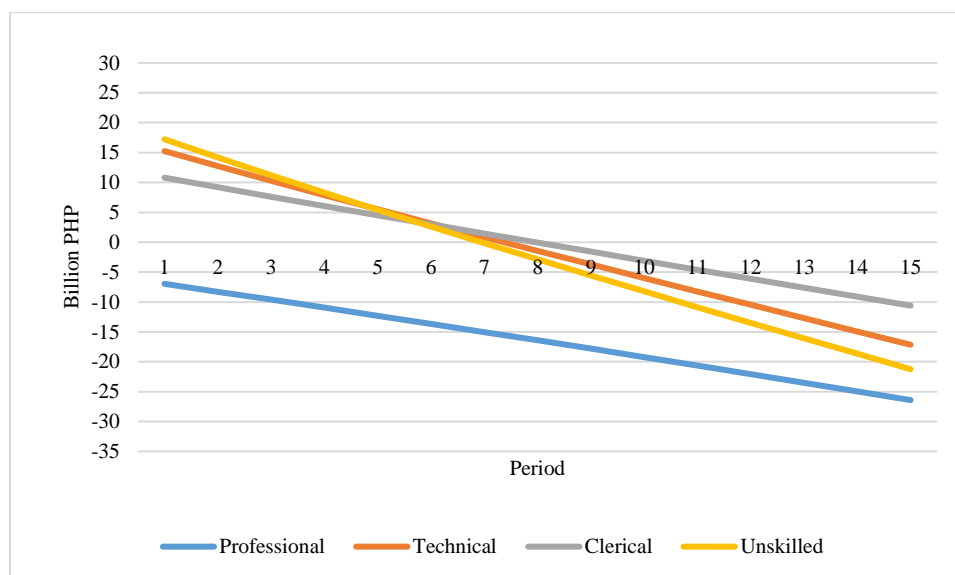
	Domestic	Foreign	Professional	Technical	Clerical	Unskilled	IDT	NCR	Luzon	Visayas	Mindanao	GOV	INV	EXT
Agriculture	-	-	-	-	-	-	-	87,172.1	229,67	88,429.2	127,380.2	8,618.14	102,108	139,606.4
Other Primary	-	-	-	-	-	-	-	45,907.9	106,68	38,897.8	51,459.09	475.79	2,025.6	83,019.96
Food	-	-	-	-	-	-	-	280,947.	740,21	284,999.	410,534.5	21,563.08	64,639.	319,008.5
Manufacturing	-	-	-	-	-	-	-	86,625.6	186,17	71,703.0	93,084.64	26,001.84	757,453	1,210,994
Petroleum	-	-	-	-	-	-	-	97,277.2	183,73	68,225.0	83,585.06	22,222.92	53,918.	122,054.5
Service	-	-	-	-	-	-	-	742,542.	1,355,	464,593.	552,804.1	589,478.6	1,206,3	931,630.0
Wholesale	-	-	-	-	-	-	-	120,526.	303,47	117,753.	163,968.5	79,515.23	2,066.1	194,180.7
Transportation	-	-	-	-	-	-	-	95,736.2	202,07	76,606.4	103,096.6	19,575.04	41.79	76,409.20
Finance	-	-	-	-	-	-	-	55,521.0	129,01	47,043.0	62,234.57	253,821.0	106.79	10,355.14
Professional	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Technical	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Clerical	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unskilled	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Domestic	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Foreign Capital	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Professional	-	-	-	-	-	-	-	-	-	-	-	-	-	249,022.3
Technical	-	-	-	-	-	-	-	-	-	-	-	-	-	343,431.1
Clerical Migrant	-	-	-	-	-	-	-	-	-	-	-	-	-	174,119.5
Unskilled	-	-	-	-	-	-	-	-	-	-	-	-	-	168,372.6
IDT	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCR	904,154.75	-	45,765.80	56,572.44	32,780.78	13,981.56	-	-	-	-	-	-	-	-
Luzon	2,427,333.9	-	134,517.32	167,566.74	99,258.56	98,805.61	-	-	-	-	-	-	-	-
Visayas	1,018,033.5	-	41,843.43	81,794.90	19,749.84	23,289.15	-	-	-	-	-	-	-	-
Mindanao	1,008,592.3	-	26,895.78	37,497.04	22,330.36	32,296.34	-	-	-	-	-	-	-	-
GOV	-	-	-	-	-	-	425,168.	252,238.	221,66	91,002.0	81,225.91	-	-	-
INV	-	-	-	-	-	-	-	44,261.3	829,20	409,665.	166,706.7	50,024.03	-	688,838.9
EXT	-	1,132,947.	-	-	-	-	-	-	-	-	-	-	-	-

Source: Philippine Statistics Authority

A.3.3. Tables and Figures of Simulation Results

Figure A.26 displays the change in migration level caused by the two percent minimum wage increase in the dynamic model (Section 5.3 of the main text). This figure appears to be the reverse of changes in the domestic employment level reported in Figure 5.1 because any decrease in employment would reflect an increase in migration level given the small unemployment effects of the two percent minimum wage increase.

Figure A. 26. Impacts on International Migration with Two Percent Minimum Wage Increase and 40 Percent FDI Increase [Deviation from the BG-BAU Level, Unit: Billion PHP].



To support the findings in Section 5.3, Table A. 16 reports the foreign capital factor intensity or the percentage of foreign capital in total capital from the 2012 SAM. The manufacturing, food and beverages, and wholesale and retail trade sectors, whose production has significantly increased due to the influx of FDI, are each endowed with approximately 20 percent foreign capital.

Table A. 16. Foreign Capital Factor Intensity.

Sector	Foreign capital intensity [in Percentage]
Manufacturing	20.1
Food and Beverages	18.9
Wholesale and Retail Trade	18.7
Finance	14.8
Service	8.7
Petroleum	5.1
Transportation	4.0
Other Primary	3.5
Agriculture	0.0

Source: Author's Computation of Sectoral Value Added in the SAM

A.4. Model Calibration

To provide additional details of my dynamic model development in Section 3.2.2, I explain in this section the adjustment and calibration processes in the SAM and the model, respectively, so that the model can generate the BG-BAU path used in my simulation experiments.

Domestic capital stock KK_j and foreign capital stock FK_j evolve over time because new domestic capital, also known as new sectoral investment IId_j , can be added to the domestic

capital stock and accumulated through the years.¹ To illustrate this evolution, the sectoral investment IId_j is added to old domestic capital stock $KK_{j,t}$ that has depreciated at the rate of dep , to determine the capital stock for the next period $KK_{j,t+1}$. The same mechanism applies to foreign capital: $FK_{j,t+1} = (1 - dep) * FK_{j,t} + IIf_{j,t}$.

As opposed to the static model, government savings are omitted in the dynamic model to simplify the process of rebalancing the government budget. Thus, government savings S^g reported in the SAM is to be subtracted from direct taxes T_{hoh}^d and reallocated into household savings S_{hoh}^p using the direct tax ratio $T_{hoh}^d / \sum_{hoh} T_{hoh}^d$.

I exhibit FDI as the sum of the value of foreign investment $pk * IIf_j$ computed based on the foreign capital service inflows and their rate of returns and depreciation: $IIf_j = \frac{pop+dep}{ror} * F_{fcap,j}$. To maintain equality in the balance of payments, FDI must be subtracted from foreign savings S^f to reflect accurate foreign savings amount.

Investment goods III are produced by the sum of the balanced-growth adjusted sectoral domestic investment IId_j and foreign investment IIf_j . To maintain the investment-saving (IS) equality where total household savings $\sum_{hoh} S_{hoh}^p$ and foreign savings S^f equal total domestic investment $\sum_j IId_j$, I adjust individual household savings considering the revised foreign savings S^f , and split S^f by households according to the ratio of domestic sectoral investment split by household group: $S_{hoh}^p = \sum_j IId_{2_{hoh,j}} - (S^f \sum_j IId_{2_{hoh,j}} / \sum_{hoh,j} IId_{2_{hoh,j}})$.²

¹ New sectoral investment here is already assumed to be consistent with the BG-BAU path:

$$IId_j = (1 + pop) * KK_j - (1 - dep) * KK_j.$$

² New sectoral investment split by household group is also assumed to be consistent with the

$$BG-BAU \text{ path: } IId_{2_{hoh,j}} = (1 + pop) * KK_{2_{hoh,j}} - (1 - dep) * KK_{2_{hoh,j}}.$$

The SAM needs to undergo a series of adjustments to accurately reflect the growth rate that dynamic CGE modelers assume to achieve the BG-BAU path, instead of employing the growth rate computed using investment and capital stock as dictated in the SAM. Thus, adjusting the amount of investment recorded in the SAM is needed to ensure that the model economy grows at the desired population growth rate to achieve the BG-BAU path.

To calculate the balanced-growth-adjusted domestic capital stock held by the household $KK2_{hoh,j}$, I need first to split domestic capital stock KK_j using the factor endowment ratio: $KK2_{hoh,j} = KK_j * FF_{hoh,lcap} / \sum_{hoh} FF_{hoh,lcap}$ and arrive at domestic sectoral investment by household: $Iid2_{hoh,j} = (1 + pop) * KK2_{hoh,j} * (1 - dep) * KK2_{hoh,j}$. I also utilize domestic capital stock held by the household $KK2_{hoh}$ to estimate the ratio $lcapshare_{hoh,j} : lcapshare_{hoh,j} = KK2_{hoh} / \sum_{hoh} KK2_{hoh}$. This ratio will be used to calculate domestic capital income by household: $\sum_i lcapshare_{hoh,j} pfd_{lcap,i,t} F_{lcap,i,t}$, and implies that the domestic capital income is larger in sectors that can accumulate more domestic capital.

I revise the actual investment reported in the SAM III_{actual} into the new assumed investment amount $III_{assumed}$ computed using domestic capital endowment $FF_{hoh,lcap}$ with population growth rate pop , depreciation rate dep and rate of return ror : $III_{assumed} = \frac{pop+dep}{ror} * FF_{hoh,lcap}$. The ratio of actual and assumed investment $adj = III_{actual} / III_{assumed}$ becomes the basis for recalculating investment good demand X^v in the SAM: $X^v = adj * SAM_{i,INV}$. The SAM's row and column sums' equality are likely lost in the process of the investment good demand adjustment. To recover the equality of the SAM, I reallocate the gap made by X^v by adjusting government consumption X^g that is now assumed exogenous in the dynamic model: $X^g = SAM_{i,GOV} - (X^v - SAM_{i,INV})$. Because of the new value of government consumption X^g , direct taxes $sumT^d$ are recomputed in a lump-sum method to achieve balance

in the government budget: $\sum T^d = \sum_i X_i^g - (\sum_i T_i^m - T_i^z)$. Direct taxes by household groups are calculated as the residual of the household budget: $T_{hoh}^d = \sum_{lab} FF_{hoh,lab} + \sum_{lab} RF_{hoh,lab} + \sum_i lcapshare_{hoh,i} * F_{lcap,i} - CC_{hoh} - S_{hoh}^p$.

A.5. Static Model Variables and Equations

Variable and Parameter Symbol List:

Sets

i, j	all sectors
h, k	factors of production
lab	all labor inputs (professional, technical, clerical, unskilled)
cap	all capital inputs (domestic and foreign)
w_all, n_all	all households (domestic and foreign)

Endogenous variables

Y_j	composite factor (value added)
$F_{h,j}$	factor input used by all sectors
$X_{i,j}$	intermediate inputs
Z_j	gross domestic output
$X_{i,hoh}^p$	household consumption
X_i^v	investment demand
X_i^g	government consumption
E_i	exports
M_i	imports

Q_i	Armington composite goods
D_i	domestic goods
$TF_{\text{hoh,lab}}$	total employed workforce
$FF_{\text{w_all,lab}}$	domestic workforce
$RF_{\text{hoh,lab}}$	foreign workforce
pfd_k	labor demand price
pfs_k	labor supply price
l_k	gap between labor demand and supply price in the static model
$\text{pRF}_{\text{hoh,lab}}$	price of foreign labor
$\text{pTF}_{\text{hoh,lab}}$	price of total employed labor workforce
py_j	price of composite factor
pz_j	supply price of gross domestic output
pq_i	price of Armington composite good
pe_i	price of exports in domestic currency
pm_i	price of imports in domestic currency
pd_i	price of domestic good
pcc_{hoh}	price of household composite consumption good
ϵ	foreign exchange rate (domestic currency / foreign currency)
$S_{\text{hoh}}^{\text{p}}$	household private savings
S^{g}	government savings
$T_{\text{hoh}}^{\text{d}}$	lump-sum direct tax revenue
T_i^{z}	production tax revenue
T_i^{m}	import tariff
CC_{hoh}	composite consumption goods (or felicity)

$UL_{hoh,lab}$ domestic unemployment

UU_{hoh} household utility

Exogenous variables

S^f foreign saving in foreign currency

p_i^{We} export price in foreign currency

p_i^{Wm} import price in foreign currency

CPI consumer price index

$total_labor_{hoh,lab}$ total labor endowment

τ_{hoh}^d household share of direct tax

τ_j^z production tax rates

τ_i^m import tariff rates

Parameters

$ax_{i,j}$ input requirement coefficients of intermediate inputs

ay_j input requirement coefficients of composite goods

$\alpha_{i,hoh}$ share parameter in composite consumption function

aaa_{hoh} scale parameter in composite consumption function

$\alpha1_{hoh}$ share parameter in utility function (for composite consumption)

$\alpha2_{hoh,lab}$ share parameter in utility function (for domestic unemployment)

$\beta_{h,j}$ share parameter in production function

b_j scale parameter in production function

μ_i share parameter of government consumption

λ_i share parameter of investment demand

δ_m, δ_d	input share parameter in the Armington composite goods production function
γ_i	scale parameter in the Armington composite goods production function
σ_i	elasticity of substitution in the Armington composite good production function
η_i	parameter defined by the Armington elasticity of substitution
$\xi d_i, \xi e_i$	share parameter in the gross domestic output transformation function
θ_i	scale parameter in the gross domestic output transformation function
$\omega_{hoh,lab}^{FF}, \omega_{hoh,lab}^{RF}$	share parameter in the labor transformation function
$\kappa_{hoh,lab}$	scale parameter in the labor transformation function
ψ_i	elasticity of transformation in the gross domestic output transformation function
ϕ_i	parameter defined by the elasticity of transformation of gross domestic output
$\nu_{hoh,lab}$	elasticity of transformation in the labor transformation function
$\chi^{hoh,lab}$	parameter defined by the elasticity of transformation in the labor transformation function
ν_{hoh}	price elasticity of labor supply
ρ_{hoh}	parameter defined by the price elasticity of labor supply
ss_{hoh}^p	average propensity for household savings
ss^g	average propensity for government savings

Model equations

i. Domestic Production Block

$$Y_j = b_j \prod_h F_{h,j}^{\beta_{h,j}} \quad (\text{Eq. 1})$$

$$F_{h,j} = \frac{\beta_{h,j} p Y_j}{pfd_h} Y_j \quad (\text{Eq. 2})$$

$$X_{i,j} = ax_{i,j} Z_j \quad (\text{Eq. 3})$$

$$Y_j = ay_j Z_j \quad (\text{Eq. 4})$$

$$pz_j = ay_j py_j + \sum_i ax_{i,j} pq_i \quad (\text{Eq. 5})$$

ii. Government

$$T_{\text{hoh}}^d = \tau_{\text{hoh}}^d (\sum_{\text{lab}} pfd_{\text{lab}} FF_{\text{hoh,lab}} + pfd_{\text{lcap}} FF_{\text{hoh,lcap}}) \quad (\text{Eq. 6})$$

$$T_j^z = \tau_j^z pz_j Z_j \quad (\text{Eq. 7})$$

$$T_i^m = \tau_i^m pm_i M_i \quad (\text{Eq. 8})$$

$$X_i^g = \frac{\mu_i}{pq_i} (\sum_{\text{hoh}} T_{\text{hoh}}^d + \sum_j T_j^z + \sum_j T_j^m - S^g) \quad (\text{Eq. 9})$$

iii. Investment and Savings

$$X_i^v = \frac{\lambda_i}{pq_i} (\sum_{\text{hoh}} S_{\text{hoh}}^p + S^g + \epsilon S^f) \quad (\text{Eq. 10})$$

$$S_{\text{hoh}}^p = ss_{\text{hoh}}^p (\sum_{\text{lab}} pfd_{\text{lab}} FF_{\text{hoh,lab}} + pfd_{\text{lcap}} FF_{\text{hoh,lcap}} + \sum_{\text{lab}} pRF_{\text{lab}} \epsilon RF_{\text{hoh,lab}}) \quad (\text{Eq. 11})$$

$$S^g = ss^g (\sum_{\text{hoh}} T_{\text{hoh}}^d + \sum_j T_j^z + \sum_j T_j^m) \quad (\text{Eq. 12})$$

iv. Household

$$X_{i,\text{hoh}}^p = \frac{\alpha_{i,\text{hoh}}}{pq_i} pcc_{\text{hoh}} CC_{\text{hoh}} \quad (\text{Eq. 13})$$

$$CC_{hoh} = aaa_{hoh} \prod_i X_{i,hoh}^{\alpha_{i,hoh}} \quad (\text{Eq. 14})$$

$$CC_{hoh} = \left(\frac{\alpha 1_{hoh}}{pcc_{hoh}} \right)^{u_{hoh}} \left[\frac{\text{FactorIncome} - T_{hoh}^d - S_{hoh}^p}{\alpha 1_{hoh}^v pcc_{hoh}^{1-v} + \alpha 2_{hoh}^v pTF_{hoh}^{1-v}} \right] \quad (\text{Eq. 15})$$

$$UL_{hoh} = \left(\frac{\alpha 2_{hoh,lab}}{pTF_{hoh,lab}} \right)^{u_{hoh}} \left[\frac{\text{FactorIncome} - T_{hoh}^d - S_{hoh}^p}{\alpha 1_{hoh}^v pcc_{hoh}^{1-v} + \alpha 2_{hoh}^v pTF_{hoh}^{1-v}} \right] \quad (\text{Eq. 16})$$

$$\begin{aligned} \text{FactorIncome}_{hoh} &= \sum_{lab} pfd_{lab} FF_{hoh,lab} + \sum_{lab} pTF_{hoh,lab} UL_{hoh,lab} + \\ &\sum_{lab} pRF_{lab} \epsilon RF_{hoh,lab} + pfd_{lcap} FF_{hoh,lcap} \end{aligned} \quad (\text{Eq. 17})$$

v. Export and Import Prices and Balance of Payments Constraint

$$pe_i = \epsilon p_i^{We} \quad (\text{Eq. 18})$$

$$pm_i = \epsilon p_i^{Wm} \quad (\text{Eq. 19})$$

$$\sum_i p_i^{We} E_i + S^f + \sum_{hoh,lab} pRF_{lab} RF_{hoh,lab} = \sum_i p_i^{Wm} M_i + \frac{pfd_{lcap}}{\epsilon} FF_{EXT,fcap} \quad (\text{Eq. 20})$$

vi. Substitution between Imports and Domestic Goods

$$Q_i = \gamma_i (\delta_i^m M_i^{\eta_i} + \delta_i^d D_i^{\eta_i})^{\frac{1}{\eta_i}} \quad (\text{Eq. 21})$$

$$M_i = \left(\frac{\gamma_i^{\eta_i} \delta_i^m p q_i}{(1 + \tau_i^m) pm_i} \right)^{\frac{1}{1 - \eta_i}} Q_i \quad (\text{Eq. 22})$$

$$D_i = \left(\frac{\gamma_i^{\eta_i} \delta_i^d p q_i}{pd_i} \right)^{\frac{1}{1 - \eta_i}} Q_i \quad (\text{Eq. 23})$$

vii. Transformation between Exports and Domestic Goods

$$Z_i = \theta_i (\xi_i^e E_i^{\phi_i} + \xi_i^d D_i^{\phi_i})^{\frac{1}{\phi_i}} \quad (\text{Eq. 24})$$

$$E_i = \left(\frac{\theta_i^{\phi_i} \xi_i^e (1 - \tau_i^z) pz_i}{pe_i} \right)^{\frac{1}{1 - \phi_i}} Z_i \quad (\text{Eq. 25})$$

$$D_i = \left(\frac{\theta_i^{\phi_i} \xi_i^d (1-\tau_i^z) p z_i}{p d_i} \right)^{\frac{1}{1-\phi_i}} Z_i \quad (\text{Eq. 26})$$

viii. Transformation between Migrant Workers and Domestic Workers

$$TF_{\text{hoh,lab}} = \kappa_{\text{hoh,lab}} \left(\omega_{\text{hoh,lab}}^{\text{RF}} RF_{\text{hoh,lab}}^{\chi_{\text{hoh,lab}}} + \omega_{\text{hoh,lab}}^{\text{FF}} FF_{\text{hoh,lab}}^{\chi_{\text{hoh,lab}}} \right)^{\frac{1}{\chi_{\text{hoh,lab}}}} \quad (\text{Eq. 27})$$

$$FF_{\text{hoh,lab}} = \left(\frac{\kappa_{\text{hoh,lab}}^{\chi_{\text{hoh,lab}}} \omega_{\text{hoh,lab}}^{\text{FF}} p TF_{\text{hoh,lab}}}{p f s_{\text{lab}}} \right)^{\frac{1}{1-\chi_{\text{hoh,lab}}}} TF_{\text{hoh,lab}} \quad (\text{Eq. 28})$$

$$RF_{\text{hoh,lab}} = \left(\frac{\kappa_{\text{hoh,lab}}^{\chi_{\text{hoh,lab}}} \omega_{\text{hoh,lab}}^{\text{RF}} p TF_{\text{hoh,lab}}}{p f s_{\text{lab}}} \right)^{\frac{1}{1-\chi_{\text{hoh,lab}}}} TF_{\text{hoh,lab}} \quad (\text{Eq. 29})$$

ix. Good and Factor Market Clearing Conditions

$$Q_i = \sum_{\text{hoh}} X_{i,\text{hoh}}^p + X_i^g + X_i^v + \sum_j X_{i,j} \quad (\text{Eq. 30})$$

Domestic factor market

$$\sum_j F_{h,j} = \sum_{w_all} F_{w_all,h} \quad (\text{Eq. 31})$$

Domestic labor supply determination (endowment less voluntary unemployment)

$$TF_{\text{hoh,lab}} = \text{total_labor}_{\text{hoh,lab}} - UL_{\text{hoh,lab}} \quad (\text{Eq. 32})$$

x. Price Equalization Conditions

$$pfd_h = pfs_h + t_h \quad (\text{Eq. 33})$$

xi. Price Index used as a Numeraire

$$\sum_{\text{hoh},i} X_{i,\text{hoh}}^{p0} = \sum_{\text{hoh},i} p q_i X_{i,\text{hoh}}^{p0} \quad (\text{Eq. 34})$$

xii. Utility Function

$$UU_{\text{hoh}} = \left(\alpha_{1\text{hoh}} CC_{\text{hoh}}^{\rho_{\text{hoh}}} + \sum_{\text{lab}} \alpha_{2\text{hoh,lab}} UL_{\text{hoh,lab}}^{\rho_{\text{hoh}}} \right)^{\frac{1}{\rho_{\text{hoh}}}} \quad (\text{Eq. 35})$$

A.6. Dynamic Model Variables and Equations

While most variables used in the static model are adopted in the dynamic model, I note some additional variables below to characterize dynamics. I assume some variables from the static model to be exogenous in the dynamic model such as government consumption X^g and omit government savings S^g for operational simplicity purposes.

Sets

$h_{\text{mobile}}, k_{\text{mobile}}$	mobile factors (labor)
$h_{\text{immobile}}, k_{\text{immobile}}$	immobile factors (domestic capital)

Endogenous variables

$\text{sum}T^d$	lump-sum direct tax revenue
T_{hoh}^d	direct tax revenue shared by household
$\text{sum}S^p$	total household private savings
IId_j	sectoral domestic investment
$IId2_{\text{hoh},j}$	sectoral domestic investment shared by household
III	composite investment
KK_j	domestic capital stock by sector
$KK2_{\text{hoh},j}$	domestic capital stock by sector shared by household
FK_j	foreign capital stock
pk	composite investment good price

Exogenous variables

X^g	government consumption
Ilf	sectoral foreign investment in foreign currency
FDI	foreign direct investment

Parameters

ι	scale parameter in composite investment production function
$lcapshare_{hoh,i}$	ratio of domestic capital stock held by household over total domestic capital stock by sector
θ_h	gap between labor demand and supply price in the dynamic model

To construct the dynamic model, I adopt most of the model equations in the static model, such as Eq. 1 to Eq. 5 for the domestic production block, Eq. 7 and Eq. 8 for the government, Eq. 13 to Eq. 16 for the household, Eq. 18 to Eq. 20 for export/import prices and the balance of payments, Eq. 21 to Eq. 26 for the substitution and transformation between imports/exports and domestic goods, Eq. 27 to Eq. 29 for the transformation between migrant and domestic workers, Eq. 30 and Eq. 32 for the good and factor market clearing conditions, Eq. 34 for the numeraire price index and Eq. 35 for the utility function. I replace some variables and model equations used in the dynamic model, such as Eq. 6 and Eq. 9 into Eq. 36 and Eq. 37 as I consider a lump-sum tax in the dynamic model.

I omit the government savings equation Eq. 12 and revise the investment and savings equations Eq. 10 and Eq. 11 into Eq. 38 and Eq. 39. I modify the household factor income to include $lcapshare_{hoh,i}$ in Eq. 40 to allocate domestic capital income by sector among

households. I add FDI to Eq. 20 of the balance of payments constraint to arrive at Eq. 41. The price equalization equation Eq. 33 in the static model is replaced by Eq. 47 in the dynamic model as I assign a different symbol for the gap between labor demand and supply price to be o_h for the dynamic model. Eq. 42 to Eq. 46 denote good and factor market clearing conditions for domestic labor, capital, and investment good markets. Lastly, dynamic equations and complementary slack conditions are elaborated in Eq. 48 to Eq. 53.

xiii. Government

$$\text{sum}T^d = (\sum_j pq_j Xg_j - \sum_j (T_j^m + T_j^z)) \quad (\text{Eq. 36})$$

$$T_{\text{hoh}}^d = \text{sum}T^d (T_{\text{hoh},0}^d / \sum_{\text{hoh}} T_{\text{hoh},0}^d) \quad (\text{Eq. 37})$$

xiv. Investment and Savings

$$X_i^v = \frac{\lambda_i}{pq_i} (\text{pk III}) \quad (\text{Eq. 38})$$

$$S_{\text{hoh}}^p = ss_{\text{hoh}}^p (\sum_{\text{lab}} pfd_{\text{lab,Agriculture}} FF_{\text{hoh,lab}} + \sum_i l\text{capshare}_{\text{hoh},i} pfd_{\text{lcap},i} F_{\text{lcap},i} + \sum_{\text{lab}} pRF_{\text{lab}} \in RF_{\text{hoh,lab}}) \quad (\text{Eq. 39})$$

xv. Household

$$\text{FactorIncome}_{\text{hoh}} = \sum_{\text{lab}} pfd_{\text{lab,Agriculture}} FF_{\text{hoh,lab}} + \sum_{\text{lab}} pTF_{\text{hoh,lab}} UL_{\text{hoh,lab}} + \sum_{\text{lab}} pRF_{\text{lab}} \in RF_{\text{hoh,lab}} + \sum_i l\text{capshare}_{\text{hoh},i} pfd_{\text{lcap},i} FF_{\text{lcap},i} \quad (\text{Eq. 40})$$

xvi. Balance of Payments Constraint

$$\sum_i p_i^{We} E_i + S^f + \text{FDI} + \sum_{\text{hoh,lab}} pRF_{\text{lab}} RF_{\text{hoh,lab}} = \sum_i p_i^{Wm} M_i + \frac{\sum_i pfd_{\text{lcap},i} F_{\text{lcap},i}}{\epsilon} \quad (\text{Eq. 41})$$

xvii. Good and Factor Market Clearing Condition

Domestic labor market

$$\sum_j F_{h_mobile,j} = \sum_{w_all} F_{w_all,h_mobile} \quad (\text{Eq. 42})$$

$$pfd_{h_mobile,j} = pfd_{h_mobile,i} \quad (\text{Eq. 43})$$

Capital market

$$F_{lcap,j} = ror KK_j \quad (\text{Eq. 44})$$

$$F_{fcap,j} = ror FK_j \quad (\text{Eq. 45})$$

Investment goods market

$$\sum_j IId_j + \sum_j IId_f = III \quad (\text{Eq. 46})$$

xviii. Price Equalization Conditions

$$pfd_h = pfs_h + o_h \quad (\text{Eq. 47})$$

xix. Dynamic Equations

$$III = \iota \prod_i X^{\lambda_i} \quad (\text{Eq. 48})$$

$$pk IId_j = \frac{pfd_{lcap,j}^{\zeta} F_{lcap,j}}{\sum_i pfd_{lcap,i}^{\zeta} F_{lcap,i}} (\text{SumSP} + \epsilon S^f) \quad (\text{Eq. 49})$$

$$pk II f_j = \frac{pfd_{fcap,j}^{\zeta} F_{fcap,j}}{\sum_i pfd_{fcap,i}^{\zeta} F_{fcap,i}} (\epsilon \text{FDI}) \quad (\text{Eq. 50})$$

xx. Complementary Slack Conditions for the minimum wage regulation

$$(pfd_{h,j} - pfd_minimum_{h,j}) o_h = 0 \quad (\text{Eq. 51})$$

$$pfd_{h,j} - pfd_minimum_{h,j} \geq 0 \quad (\text{Eq. 52})$$

$$o_h \geq 0 \quad (\text{Eq. 53})$$