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Gross Domestic Products (GDP) is not a Proper Indicator of Measurement and Economic Power Comparison for Emerging Economies: A Judgement from International Distributions of Net Factor Income from Abroad

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ABSTRACT

Global distributions of net factor income from abroad (NFI) during 1990-2019 have witnessed that (1) the United States is the top one country accounting for 40% of surpluses of the global total, while a surge in China's deficit with its GDP increase; (2) GDP growth in emerging economies has a price scissors with NFI deficits; (3) asymmetric NFI has covered up the severity of rich countries' global arbitrages especially from emerging economies; (4) China's economic power is exaggerated by the PPP-based GDP implemented by the World Bank. It concludes that (1) developing countries have paid for huge hidden cost for their emergence; (2) the statement of the United States suffering losses absolutely does not hold; (3) GDP is not a universal tool for measuring what matters. It suggests that (1) emerging economies countries should beware of the potential misleading of GDP on economic measurement and economic power comparison ; (2) GDP should be critiqued from the applicability perspective of economies' types; (3) it is urgent to clarify some misjudgment and misleading concepts in the economic affairs surrounding the global value chain patterns; (4) the construction of national governance capacity in emerging economies should focus on "social infrastructure", of which one of the important parts is an effective economic statistics system; (5) emerging economies should carry out the strategic layout of international economic statistics talents to enhance their soft powers.

KEYWORDS

Gross Domestic Product (GDP); Net Factor Incomes from abroad (NFI); NFI Surplus; NFI Deficit; National Economic Power

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More than 30 years since the 1990s have seen vigorous and rapid globalisation, global arbitrage in developed countries and rapid growth in emerging economies. The Covid-19 pandemic has triggered greater uncertainty and global economy is in a downward trend, which is crucial to judge the trend of international cooperation and competition pattern and national situation. From the perspective of factor income distribution among countries, this paper uses the quantitative indicator of Net Factor Income from abroad (NFI) – the difference between gross national income (GNI) and gross domestic product (GDP) – to reveal the competitive pattern of international cooperation and factor income distribution between developed and emerging economies. The aim of this paper is to identify cognitive traps and debunk data illusions and provide insightful implications into the huge international interests and the international economic relations that lie behind economic data.

For the analysis of national strengths of China and other emerging economies, the new perspective on factor income distribution among countries from economic statistics can both provide a solid methodological and empirical basis for dealing with the uncertainties arising from international trade frictions such as those between China and the US and the global Covid-19 pandemic and guide possible development achievement for global emerging economies, for instance, China's 14th Five-Year Plan(2021-2025) for National Economic and Social Development and the Long-Range Objectives Through the year 2035. In this way, emerging economies will be able to take a more proactive position in the new pattern of international cooperation and competition.

1. The measure of NFI and its decomposition framework

1.1. GNI is better than GDP in reflecting national economic strength

The macro aggregate indicator reflecting the size of a country's economy was originally Gross National Product (GNP) – modified as gross national income (GNI) – in the pioneering days of national accounting in the 1940s, and was later changed to GDP in the 1990s due to the increasingly complex and volatile nature of international economic ownership relations, which has been widely used by countries (Carson 1975; Berndt et al. 1990; United Nations et al. 2012).

GDP is a measure of final products produced by all resident units[1] within a country's economic territory in a given period, measured as the sum of value added (i.e., output minus intermediate consumption), plus product taxes minus product subsidies (i.e., taxes on production, taxes on imports, minus production subsidies and import subsidies) (United Nations et al. 2012). Value added is a strict measure for production determined by output and intermediate consumption, whereas product taxes minus subsidies are taxes levied and subsidies provided on production and imports, and thus GDP is a measure of production.

Unlike GDP, GNI is not a production concept from value added but an income concept. GNI is primary income allocations among input factors mainly being labour and capital that participate in the production process to generate value added and receive productive income based on their contribution to production. GNI is essentially a measure of factor income directly involved in production. GNI, therefore, is the total primary income receivable by a resident institutional unit or sector (United Nations et al. 2012).

In terms of above basic concepts, GDP is the sum of the value added of all resident units, whilst GNI is the sum of the primary income of all resident units. Since both indicators are derived by summing up the same resident units, i.e., they both measure the economic aggregate consisting of all resident institutional units or sectors, the difference

[1] The resident unit is a classification of the total economic by international statistical standards and is a full-caliber concept corresponding to a country's economic overall. It divides a country's economy into five major institutional sectors, that is, non-financial corporations, financial corporations, general government, households, and non-profit institutions serving households. The counterpart to the resident unit is the non-resident unit, which is resident abroad.

of GDP and GNI lies not in the caliber and scope of both indicators, but in their essential function. The terms 'domestic' in GDP and 'national' used in GNI are simply long-established conventions in the economic field, both referring to the resident units of one country with the emphasis on the production and income of the resident units, respectively (United Nations et al. 2012).

GNI, as an income aggregate, shows the income received by one country's nationals (or domestic, resident units) through the factors such as labour and capital putting into the production process with meaning that primary income corresponds to factor income. It can reflect the country's ability to generate income from domestic and foreign economic activities and is one of the main sources of national power accumulation2. GDP is an production aggregate, the value of which better reflects the degree of economic production activities in the country's economic territory. GDP may include local low-wage employment generated by foreign investment, which in turn generates productive activities embodied in the income of other countries. To reflect a country's economic strength, GNI is conceptually superior to GDP, whilst GDP is superior to GNI in terms of data availability.

1.2. GNI and GDP are cross-cutting indicators

According to the logic of economic production and primary distribution, GNI is the value added created3 through domestic production (GDP) minus the primary income paid to nonresidents participating in domestic production, plus the primary income received from residents participating in foreign production. The value difference of GNI and GDP is equal to the difference of the primary income received from abroad and paid to abroad.

In terms of the numerical relationship of both indicators, GNI minus GDP equals NFI, i.e., factor income received by the country from abroad minus factor income paid by the country to abroad. Specifically, GNI equals GDP minus compensation of employees, property income, and product taxes minus subsidies, payable abroad respectively, plus the corresponding items receivable from abroad (United Nations et al. 2012).

We assume country A as the accounting entity to illustrate the relationship between GNI and GDP from the perspective of national income. Figure 1 shows the left and the right ellipses representing GNI and GDP of country A, respectively. GNI of country A includes factor income earned by its own nationals in its own and foreign economic territories (Rest of World, ROC), while GDP of country A includes factor income earned by its own and foreign nationals (Foreigners) in its own economic territory. The overlap between the two, factor income earned by country A's nationals in its own economic territory, is undoubtedly part of the country's income accumulation; whilst the difference between the two, net factor income from abroad, is vital to international economic relations, which needs to be focused on.

Based on Figure 1, the identical relation between GNI and GDP can be written as follows.

GNI of A - Factor income earned by A's nationals in foreign economic territories = GDP of A - Factor income earned by foreign nationals in its own economic territory.

It can be derived that:

GNI of A - GDP of A

= Factor income earned by A's nationals in foreign economic territories - Factor income earned by foreign nationals in its own economic territory

=NFI of A

[2] Angus Deaton emphasized that "we cannot consume what is not ours." at the 2020 American Economics Conference, suggesting that national power comes from income rather than production. See Angus Deaton (2020). GDP and Beyond. Survey of Current Business, Volume 100, Number 6.

[3] To simplify the illustration, it is assumed that value added is measured by producer prices and is equal to the sum of the basic price measure of value added and production taxes minus production subsidies, i.e., the sum of value added is GDP.

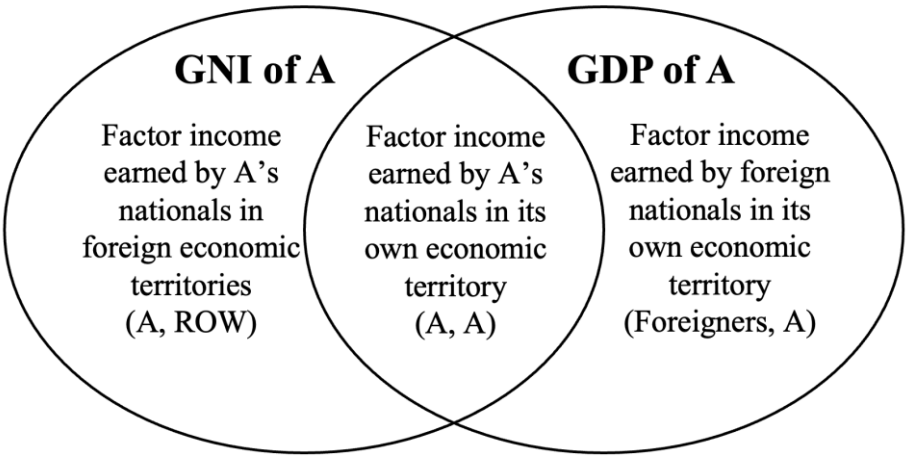

Figure 1. Diagram of the relationship between GNI and GDP of A.

Based on the actual value of the NFI, this paper defines an NFI surplus if a country's NFI greater than zero; conversely, an NFI deficit if its NFI less than zero. If the NFI of country A is greater than zero, it means that the factor income that country A receives from production activities in other countries is greater than the factor income that country A provides to foreign countries, then country A can enhance its economic strength from the net income received by other countries, i.e. country A is a net power-importing country; conversely, the factor income that country A receives from production activities in other countries is less than the factor income that country A provides to foreign countries. The income generated in country A supports the national power of other countries more than the foreign country support to its own national strength, i.e. country A is a net power-exporting country.

1.3. A theoretical framework for the distribution of national income among countries

Extending the model of NFI in one country in Figure 1 to a multi-country factor income distribution in Figure 2 provides a clearer picture of economic relations between countries. Assuming that there are two countries, A and B4, from a row perspective, in the global economic system, the value added created by production activities in each country is distributed between the resident units and the non-resident units involved in production in the country, i.e., the primary distribution of income based on value added includes both local income and foreign factor income. The value added created by productive activities in the economic territory of country A is distributed to not only nationals of country A (resident units), but also nationals of country B who are involved in GDP-producing activities in country A (non-resident units/foreigners). Similarly, the value added created by production activities in country B is also distributed likewise. From a column perspective, the resources of factor income of each country come from both at home and abroad, i.e., local factor income and foreign factor income. In the case of country A, national income of country A consists of factor income derived from domestic production by resident units in the country A, plus the factor income derived from production in country B. Likewise, national income of country B is in the similar way.

GNI of country A is the final resource of national power of country A. The national income ultimately received by country A is the factor income received from production by resident units in the country A, plus that in country B, minus paid by country A to country B from production by non-resident units in the country A. Diagonal elements in Figure 2, in case of country A, being factor income earned by A's nationals in its own economic territory (A, A), is the domestic resources contributed to A's national economic power. For off-diagonal elements, factor income earned

[4] The standard statistical concept should be "economy", but the term "country" is used here to be consistent with the aforementioned conceptual model.。

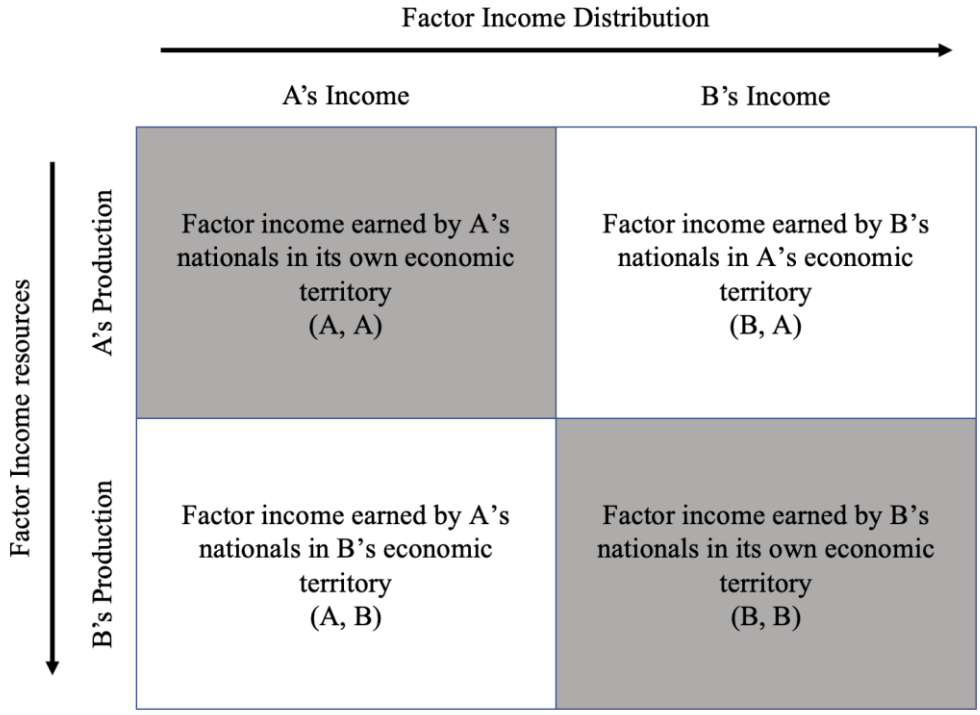

Figure 2. A Two-country NFI distribution theoretical framework.

Note: Compared with Figure 1, country A is the accounting entity and country B is the foreign economic territories (Rest of World, ROC)

by A's nationals in B's economic territory (A, B), being the imported income of country A (the lower-left element), minus factor income earned by B's nationals in A's economic territory (B, A), being the exported income of country A (the upper-right element), is the NFI of country A with the international resource contributed to A's national economic power and reflects the production factor relations between country A and B. Similarly, the resource of B's national power is also in this way.

It is noted that in the two-country NFI model (Figure 2), the NFI of country B is as equal numerical value as the NFI of country A, with the opposite sign, i.e., the NFI of country B is (B,A) minus (A,B), exactly the opposite of the NFI of country A ((A,B) minus (B,A)). The implication is that if the NFI of country A is greater than zero, then country A is an NFI surplus country, indicating that the foreign factor income of country A is greater than the foreign factor exports of country A, and then the resource of A's income is from country B and country A is a factor income importing country. Correspondingly, the NFI of country B is less than zero. Thus, country B is a NFI deficit country and a factor income exporting country. Country B exports its income to country A, i.e., in terms of the exporting of production-generating income in country B, the destination country is essentially country A.

Figure 2 only represents two countries, A and B, in the global economic system. It reflects that country A's surplus comes from country B's deficit, i.e., the income generated by the economic production in both countries, apart from the portion remained in the country to form a national power, the rest is distributed abroad to achieve the substantive purpose of factor exchanges between the two countries. If country A or B belongs to different types of countries, for example, developed and emerging economies, respectively, then both the NFI surplus for country A and the NFI deficit for country B will have a significant meaning for both countries. In the progress of globalization, if country A as a developed country holding high position in the global production chain and country B as an emerging economy being at the low or middle position, country A's international factor income (NFI surplus) will

come from country B's NFI deficit, i.e., the factor income that country B providing to country A forms country A's national economic strength.

Extending the two-country NFI model to a three (or more) -country NFI model, the NFI surpluses of major developed countries can be derived from the NFI deficits of lots of emerging economies, and a significant distribution of factor income generated by emerging economies going to developed countries is the main resource of national power for developed countries. Thus, it is the first time to classify the countries all over the world into "NFI surplus countries" and "NFI deficit countries" based on their NFI surpluses and deficits, which can reflect the resources and destinations of factor income among countries. This perspective has long been neglected, but it is necessary for a deep understanding of international relations between the major economic entities.

2. Overview of the distribution of NFI among countries

Based on the above theoretical analysis, the second part gives evidence for the empirical analysis with economic data5.

2.1. Status of major NFI surplus countries

Over the 30 years from 1990 to 2019, more than 70% of the global NFI surplus was occured in a few major developed countries such as the US, Japan, the UK, France, Switzerland and Germany (Appendix 1, "Major Global NFI Surplus and Deficit Countries"). Figure 3 shows the decline of British national power and the declining trend has been centralized in the US, Japan, Germany and France in the last decade. These four countries held the top four and accounted for more than 70% of the total global NFI surplus for 15 consecutive years. What's more, the US and Japan held a prominent position with the US in particular having an overwhelmingly dominant statues.

The US was not only a NFI profit earner overall, but also occupied the first position among major developed countries. With a cumulated total NFI surplus of $4,036.9 billion and an average annual surplus of $134.6 billion, the development of the US NFI showed different profiles every decade. During 1990-1999, the US NFI shifted from deficit to surplus. In the second decade of 2000-2009, except 2008 and 2009 the global financial crisis, the US already had over $100 billion NFI surpluses. However, since 2010, it has grown rapidly, with a cumulated surplus of $3,447 billion and an average annual surplus of $344.7 billion, accounting for 1.92% of GDP. In the last decade, its NFI surplus accounted for 40% of the global total NFI surplus, exceeding the combined NFI surpluses of the three largest NFI surplus countries, Japan, Germany and France. It is clear that in the last decade of globalization, the US's profitability from overseas is masked by the scale of its GDP.

The NFI alone is proof enough that the 'US Loss Theory' is absolutely not true. The United States engages foreign countries with multinational corporations and foreign direct investment (FDI). In the context of globalization and the vertical specialisation of production, the US has taken advantage of the cheap labor in developing countries to engage in global production. Increasingly, U.S. multinationals and overseas investments are valued by global scale, creating monopoly giants and global corporations and other winner-take-all companies (Shi and Yu 2021), arbitraging in countries around the world, taking abundant labor and capital and other factor income from the globe. The return of the factor income (primary income distribution) to the US coming into redistribution has exacerbated the problem of income distribution in the country. The top '1%' of the US (the ultra-high income

[5] The data we analyzed in this paper is based on the latest data released by the World Bank in July 2020, while the data we used in writing the preliminary draft are based on the old version in 2018. Comparing the results of the two sets of data, we find that the changes have no impact on the conclusions of this paper and make it even more confirmed.

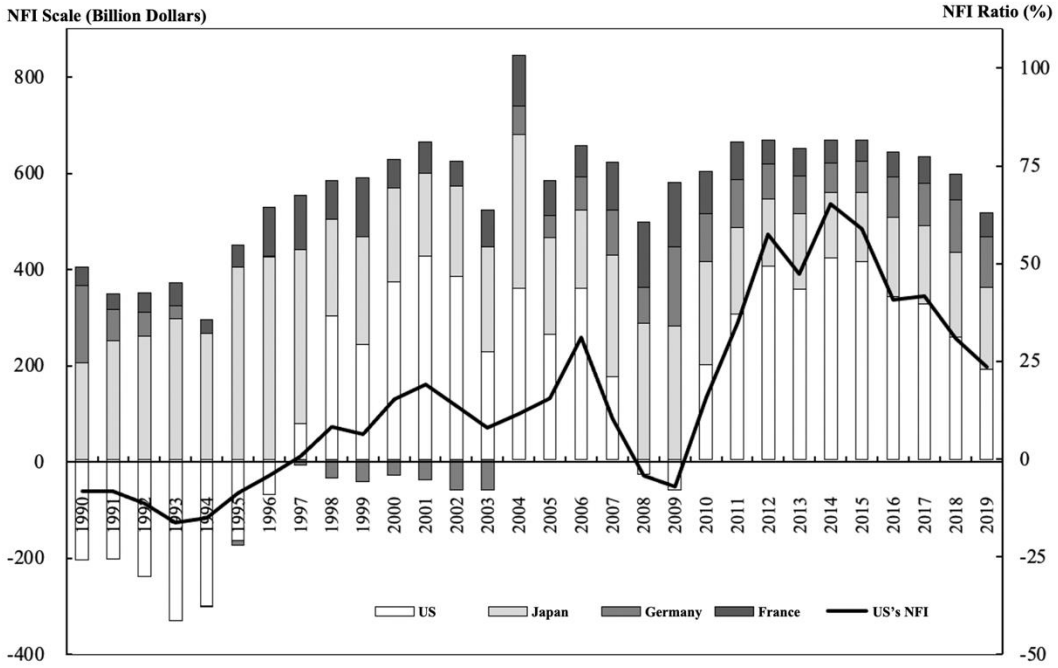

Figure 3. Percentage of Major NFI Surplus Countries and NFI Scale of the US.

group) having an ever increasing share of income and a remarkably high gross income, and the middle class, on the other hand, having experienced income stagnation and relative income decline, implied that the distribution of wealth within the US is much more uneven than ever in the decades. The US politicians have been well aware of the widening gap in domestic income distribution, but have not had the will or ability to address the worsening gap in labor income and the declining share of employee compensation in GDP. To evade responsibility, the US, however, had used the US-China trade deficit as an excuse to put China as its scapegoat and then to cover up the huge profits it has been gained in the international market. From the perspective of macroeconomic statistics, this paper first takes the international standard income concept of 'net factor income from abroad' (NFI) as a measure of national power to expose the truth about the global profitability of the US and help countries around the world distinguish between right and wrong and provide a guidance to countries to understand the global factor income distribution pattern.

2.2. Status of major NFI deficit countries

NFI deficit countries are widely distributed, involving dozens of countries, which are mainly emerging economies, especially some developing countries. Based on GNI and GDP data from the World Bank database, we seleted 34 major NFI deficit countries from over 200 economies worldwide, consisting of 21 NFI deficit countries in emerging economies (including 6 OECD countries)6, five OECD persistent NFI deficit countries7, four OECD

[6] The 21 emerging economies include: (1) 15 countries that are not part of the OECD, including five BRICS countries: China, Brazil, India, Russia and South Africa, as well as Indonesia, Argentina, Malaysia, Thailand, Vietnam, Peru, Angola, Nigeria, Sudan and Kazakhstan. (2) Six OECD member countries: Colombia, Mexico, Chile, Poland, the Czech Republic and Hungary, of which Colombia officially becomes the 37th OECD member country on April 28, 2020.
[7] The countries in the OECD with persistent NFI deficits mainly include: Ireland, Australia, Canada, Spain, and New Zealand.

fluctuating NFI countries8, and four NFI special economies9. Since 1990, the 34 major NFI deficit countries have accounted for 72.36% of the global NFI deficit and it has been stabilized at 75.17% and 75.71%, respectively, in the last two decades. At the same time, the global share of 21 emerging economies has increased at a rate of around 10% per decade, each at 29.99%, 40.95% and 49.34%, respectively. In particular, the 10% increase per decade mainly comes from 15 emerging economies, that are not in the OECD, whose corresponding shares each decade are 22.83%, 29.76% and 38.67% respectively. Over the past 20 years, especially in the decade following the global financial crisis, as globalization intensified and global value chains extended and complicated, these emerging economies became major participants as upstream producers in the low position of the global production chains, reaped by the downstream countries, in the middle or high position, for the incomes they created, as a main resource contributing to the growth in national power of thses NFI surplus countries. This provides evidence that major NFI surplus countries arbitrage from the globe, from the perspective of NFI deficit countries.

GDP growth in emerging economies has an increased price scissors difference with NFI deficits. Emerging economies have been experiencing rapid growth for decades. They have a solid industrial foundation and somewhat well-regulated market mechanisms, especially, with the domestic labour force entering the manufacturing industry to participate in globalised production networks. Thus, 'emerging' is supposed to mean that these economies have greater 'NFI' capacity. However, a comparative analysis of data from 34 major NFI deficit countries (Appendix 2, Trends in NFI and GDP of Major Global Deficit Countries) shows that as the GDP of emerging economies has been rising, their NFI deficits have also tended to increase rapidly. This phenomenon10is especially prominent in the recent economic globalization process, which is also illustrated by the data of China in Figure 4. It implies that the rapid growth shown by emerging economies in the process of globalisation is only the result measured directly in terms of production, while a fairly high proportion of the factor income is obtained by developed countries in the form of international distribution, greatly exceeding the level of factor income they receive from the world, i.e., a significant part of the production contributes to the growth of national power of the major developed countries, which is a huge loss hidden behind the apparent prosperity in developing countries. Clearly, it is a huge implicit cost for developing countries in the process of "emerging" by being taken advantage of factor income by major developed countries.

China's NFI deficit has been growing dramatically as its GDP increased. Over 30 years, China's gross aggregate NFI deficit is US$511.3 billion, more than 75% (about US$387.6 billion) of which gained in the last ten years. During the recent 20 years, only three years, 2007, 2008 and 2014, showed slight NFI surpluses affected by the global financial crisis in 2008 (Figure 4). Generally, China is still an NFI deficit country. International comparison shows that China's NFI deficit accounted for 3.36% of the global gross NFI deficit over the 30 years, ranking fourth among emerging economies, after Brazil, Russia and Indonesia, with US$174.3 billion more than India. Nevertheless, in the last decade, China's NFI deficit has soared to 4.74% of the global deficit, ranking the third among emerging economies after Brazil and Russia, and more than India's US$145.4 billion. This indicates that the implicit costs (factor income migration) paid by China during its economic development have been increasing rapidly in recent years and that it is one of the main sources of global arbitrage for developed countries. In 2020, owing to the effects of the Covid-19 pandemic, against the background of a sharp 42% decline in global FDI, China's FDI was up, reaching $144.37 billion, representing a 4.5% year-on-year increase11. Developed countries such as the US, Japan, the Netherlands, Germany, the UK and France are still the main sources of FDI used in China. In terms of NFI, major developed countries can be expected to continue deriving substantial factor income from China in the future, and

[8] The countries in the OECD with fluctuating NFI mainly include: Finland, Portugal, Israel, and Italy.
[9] Special economies include: Puerto Rico, Qatar, Luxembourg and Singapore.
[10] The effect of magnitude differences between the two indicators was excluded from the comparison.
[11] UNCTAD, Global Investment Trend Monitor, No. 38 (UNCTAD/DIAE/IA/), 24 Jan 2021.

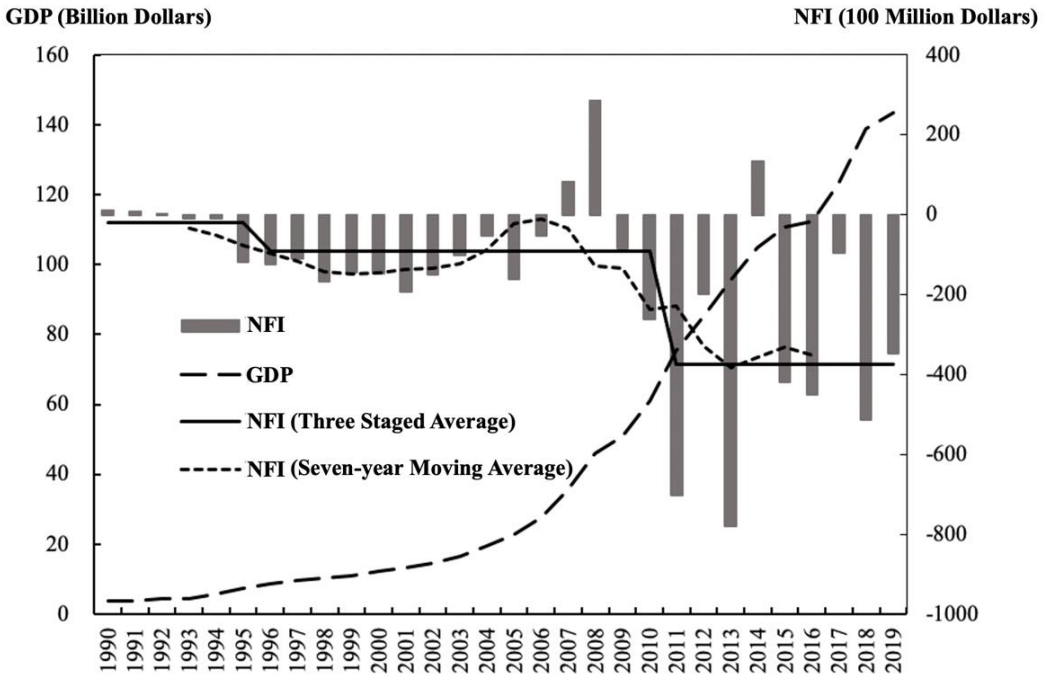

Figure 4. Trends of NFI and GDP in China, 1990-2019.

then China's NFI deficit will persistently widen.

2.3. Asymmetry of NFI surpluses and deficits

The global NFI surpluses and deficits are asymmetrically distributed across countries. The four major NFI surplus countries, the US, Japan, Germany and France, and the combined of the 34 NFI deficit countries have roughly equal shares; The sum NFI deficit of the 15 emerging economies that are not in the OECD accounted for 38.67% of the global gross NFI deficit in a recent decade, with most years being above 40%, reaching the peak of over 45% in 2013. This shows the brutal international competition presented by emerging economies in pursuit of rapid growth, with these emerging economies scrambling for the opportunity to be taken advantage of by the central rich countries ("the first group of developed countries").

From the perspective of the cross-country distribution of factor Income, NFI asymmetric pattern obscures the severity of global arbitrage by the top-rich countries. Emerging economies need to compete for 'entry' into global value chains in order to derive the impetus and resource of their fast economic growth from globalization. However, developed countries are trying to prevent emerging economies from increasing their profitability (i.e., the ability to promote growth through increasing productivity and encouraging innovation: by introducing new manufacturing techniques to enhance product competitiveness and then to guarantee export growth; or producing high-quality, innovative, high-value-added products to boost the purchasing power of the middle class and drive domestic demand for their own economic growth), to ensure the rich countries staying at the middle and top position of the global value chain (Possessing high-tech and innovative power to produce high-value-added products and obtain high returns), in order to stabilize their access to high returns from emerging economies all over the world. To that end, developed countries have defined the role of developing countries in such a way that poor countries should join global value chains, but only be fixed in a lower position of the value chain. A typical example is that developed countries such as the US have determined that China should not stop accepting 'imported waste', arguing that China's restrictions on imports of 'reusable goods' seriously interfere with the global scrap supply chain and violate World Trade Organization (WTO) obligations, and perceived China as treating the domestic and foreign waste

industries differently and adopting other excessive trade restriction policies. Developed countries are working together to obstruct the rise of emerging economies in the global value chain, which is an important external cause of the so-called 'middle-income trap'12.

3. Interpreting the caliber of NFI-related indicators

3.1. 'Adjusted NFI' should be further calculated

According to the balance of the indicators, in a global economic boundary, the sum of the gross NFI surplus and the gross NFI deficit should be zero, but most of the years the World Bank published data, the gross NFI surplus is smaller than the gross NFI deficit13. To deal with this situation, this paper first develops an revised indicator named 'Adjusted NFI (ANFI)' by adding the corresponding adjusted value to each country's NFI to obtain the ANFI, which is determined as follows: if the global gross factor income surplus is greater than the gross deficit, we will split the excess surplus to the deficit countries in proportion to their deficit values, and then the deficit of these country will increase; conversely, the surplus of the surplus country will increase. The change of the NFI before and after the adjustment can be seen in Appendix 1 Global Major NFI Surplus and Deficit Countries.

The ANFI is quite important for the analysis of the national power of the countries that have switched between NFI surplus or deficit, highlighting the trend of strengthening or weakening of their national power. For example, the UK's national power is divided into two phases by the year 2000 (Figure 5). Before 2000, the UK experienced a shift in NFI from surplus to deficit. But in the early years of the 1990s, the ANFI showed a double relative to the NFI, with its surplus proportion worldwide falling in the range of 20-45% and ANFI contributing 5-12% of UK domestic GDP, demonstrating that the UK's national power had grown drastically in the 1990s by importing foreign national income. After 2000, except for 2000-2006, when the UK showed a slight ANFI surplus and there was not much difference between NFI and ANFI; since 2007, the UK has shown a long-term ANFI deficit for more than a decade, especially in recent years the ANFI deficit has risen sharply, with the ANFI peaking at a size of US$83 billion in 2014, representing 8% of the global deficit. Clearly, the significant reduction in the import of NFI to the UK is a direct signal of its weakening national power. At the same time, the US replaced the UK and presented a huge NFI surplus all over the world, occupying its dominant position among the world's major NFI surplus countries and being the most beneficial player worldwide.

3.2. GNI tends to be biased towards undercounting

Each country's GNI is estimated by summing GDP and NFI, both of which are not equally reliable, making GNI often biased towards underestimation. GDP is a relatively well established measure of production, and the value added of countries based on output minus intermediate consumption; whereas the NFI estimate relates to factor income and payment transactions between domestic and abroad (non-resident units), including compensation receivable and payable for employees of frontier workers, seasonal workers and foreign personnel with their economic centers of interest in this country, production taxes (minus production subsidies) and import taxes (minus import subsidies) receivable and payable by governments, and property income such as interest, dividends, investment income and land rent receivable and payable by enterprises. The statistics and estimation of these items

12 The Middle-income trap (MIT) was first proposed by Gill and Khara in the 2007 World Bank report 'An East Asian Renaissance: Ideas for Economic Growth'. The 'middle-income trap' is a phenomenon that occurs when a country experiencing rapid growth before reaching the middle-income level and then stagnating at that level, unable to catch up with the developed economies.

13 Calculated from World Bank data, source: World Bank database https://data.worldbank.org.

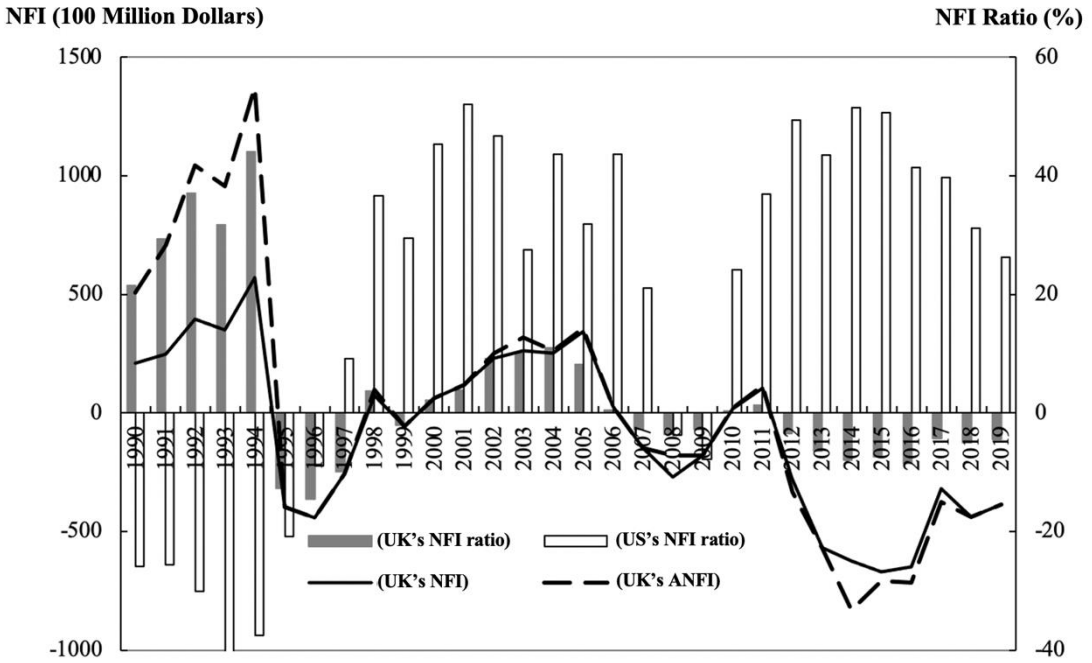

Figure 5. Trends of NFI in the UK from 1990 to 2019.

are generally accurate and completed for items payable by the home country to foreign countries, since the main accounting entity is the domestic production unit, the data for each initial income item payable to foreign countries are complete; while for the items receivable by the country from foreign countries, each initial income item is derived by participating in foreign production, and its data source comes from foreign fundamental units, not directly from the national statistical system. Therefore, this part of data must be obtained through indirect calculations or estimations, and then the acquisition of income data is prone to undercounting, thus underestimating the factor income receivable from abroad. The NFI is the difference between the initial income received from abroad and that payable to abroad, and thus there is a risk of underestimation of the NFI.

It is a weakness of human nature to be insensitive to income rather than to expenditure, thus it is easy to take it for granted, especially in developed countries. The developed countries have gained a lot of investment income through overseas investments and multinational corporations. They stay at the top position in the global value chain through technological innovation and monopoly, benefiting from the large amount of labor and capital rewards from emerging economies as upstream producers in the low position. This process may be subject to undercounting, however the actual gains obtained are so large that they are still an underestimate of their NFI surplus compared to each other. Thus, NFI data are more likely to be an underestimation of the surplus of developed countries and the deficit of emerging economies. If this part of GNI can be estimated, the difference between surpluses and deficits of NFIs will be even more evident.

From the existing NFI, ANFI or the underestimation of GNI, it can be seen that there is a huge difference between rich and poor countries in 'foreign factor income capability'. The three indicators all point to the 'foreign factor income', that is, the part of the income that the economies receive from other countries (i.e., the off-diagonal elements on each economy's column in Figure 2). Assuming a fixed distribution structure of global factor income, in addition to domestic income, the ability to obtain factor income from abroad is the ability to derive national power from external sources, i.e., the possibility for an economy to obtain factor income globally in terms of labor, capital and technology from employee compensation, net production taxes, net import taxes, property income and

so on. This ability is one of the most significant indicators of knowing a country's national power and is the key to determining the international distribution pattern of global factor income, which coincides with the basic aspiration of high-quality development in emerging economies. Only with sustainable and healthy development, fully utilized growth potential, optimized economic structure and improved innovation capacity, the level of modernization of the industrial chain and the status of the country can be significantly promoted.

3.3. A new indicator of '1% absolute value' of the NFI should be taken into account

The relative value of GDP and GNI is small, with most countries having NFI of around 1% of their GDP14. It seems that the mixing of GDP and GNI have no impact on economic analysis or national power measurement. Yet, if we ignore the differences in the volume of GDP and GNI, using mainly GDP to analyze trends and changes in economic production scale or income levels across years may be meaningful for a single country. However, it can be a considerable problem when conducting comparative analysis between countries. Because the spatial analysis of the cross countries' economic volume is different from the time series analysis of individual countries' economic volume, the '1% absolute value' of the NFI varies greatly among countries depending on their economic volumes. The NFI of several major developed economies is much more than the GDP of many countries, for example, the annual NFI of the US is greater than the annual GDP of more than 80% of the world's economies in the last decade, with the greatest in 2014 when it exceeded that of 86% of economies.

In addition, NFI is a surplus in some countries and a deficit in others globally. One is positive and the other is negative, with very different economic implications for different types of countries. Major developed countries are less concerned about NFI differences because they are at the top position of global value chains. By absorbing production factors from other countries with lower costs, developed countries have gained a significant cost-effective competitive advantage worldwide. Through cutting-edge technological innovation and digital transformation revolution, it has contributed to the rising status of developed countries in the global value chains, from which they have engaged in massive arbitrage and maintained a surplus pattern overall.

In contrast, billions of workforce in developing countries are involved in the international production system dominated by developed countries on a large scale, developing skilled and efficient enterprises, and gradually competing for primary market opportunities, which are reflected in the economic growth and poverty reduction, but they are in a relatively inferior downstream position in the international production system, where most of the productive income generated is captured by developed countries, resulting in a negative NFI in developing countries. Therefore, the difference of each countries' NFI is quite important for emerging economies to find their true position in the globalization process.

In summary, GDP is not a universal indicator. It is necessary to distinguish between GDP and GNI for different types of countries. At least for developed countries and emerging economies, such a distinction has strategic implications that deserve deep thought and attention.

3.4. Amplification of NFI by Purchasing Power Parities

The International Comparison Program (ICP) of the World Bank has calculated Purchasing Power Parity (PPP) based on expenditure-side GDP. Using PPP-based comparable GDP across countries, ICP compares the relative differences between economies in the level of income per capita (PPP-based GDP per capita) and the level of resident consumption (PPP-based actual consumption per capita), and thus measures income inequality and global poverty across countries.

We believe that to reflect income levels and living standards, GNI should have been used as the basic indicator

14 This conclusion is calculated based on data from the World Bank database on both GDP and GNI over the period 1990-2019, and due to length constraints, the full results are not presented in this paper.

for international comparison. However, due to the long-established tradition of using GDP, although the components of PPP GDP including consumption, investment, import and export etc., the expenditure-side GDP can only give a certain reference to the expenditure of residents' living standards from the perspective of individual consumption expenditure, rather than truly reflecting the actual income level of a country.

At the same time, the magnifying effect of PPP on NFI is noteworthy. The World Bank calculates the PPP conversion factor, which for developing countries is usually smaller than the market exchange rate, and inversely for developed countries. Taking the comparison between China and the US as an example, if taking the NFI into account and using the US as the benchmark country, China's economic power is exaggerated by the prevailing international statistical comparison methods. Over the three decades since the 1990s, PPP GDP of China has been magnified by approximately 1.8-3.9 times of the current price GDP, and correspondingly, NFI has been magnified similarly. If we further consider the bias implied by international comparison methods, the scale of the economy will be exaggerated even more. Globally, the NFI deficits of emerging economies and developing countries are exaggerated, i.e. the national power imported to other countries is magnified; while the NFI surpluses of developed countries are further minimized. The gap between the global deficit and surplus widens, then the ANFI surplus increases, the real volume of global arbitrage by developed countries is expanded even more, and the real economic power of developed countries is also increased a lot.

3.5. The nature of 'outsourcing' is an implicit form of global arbitrage

The NFI is only part of the benefits that developed countries take from emerging economies. Developed countries, through 'outsourcing', massively transfer inefficient and costly production processes to emerging economies with low labour costs. The labor in emerging economies is involved in the manufacturing and packaging of outsourcing products. Compared with the final selling price of outsourcing products (product output), their workforce receives very low compensation. This part of production is included in the GDP of the emerging economies according to international statistical standards, while the developed countries, by controlling the technological innovation and higher productivity aspects of the products such as design and sales, gain a gross profit much higher than the cost of outsourcing. This gross profit is distributed domestically in the form of employee compensation, government taxes and corporate operating surpluses, and accordingly included in the GDP of the developed country.

In comparison, FDI is an explicit way for developed countries to gain factor income (mainly investment income) from the world to improve NFI and national power, while outsourcing is a way for developed countries to maximise their operating surplus (profit) by minimising the production cost by using low-cost labour globally. Developed countries through moving out the the inefficient and high-cost production process, apparently, provide emerging economies employment opportunities and labor compensation. Meanwhile, the export-oriented development approach allows the emerging economies to achieve much faster economic growth and rapid expansion of GDP scale. In fact, this is an implicit way for developed countries to arbitrage production factors abroad. This is because according to the standard statistical rules of GDP, developed countries make huge profits from the difference between the output of their products (e.g., massive output obtained from monopoly sales) and the low-cost global production chain, then the operating surplus is left directly in their GDP, exaggerating the size of its GDP for its global arbitrage.

This implicit approach is expressed in the standard statistical method of calculating GDP: developed countries through trading innovation quietly change the value created by emerging economies into their GDP, as if it were the logical income of their technological innovation and productivity gains. In the 1950s, several versions of the System

of National Accounts (SNA)15, officially published by the United Nations and other international organisations, were developed on the basis of neoclassical economics. According to the standard measures in the SNA about factor inputs and outputs, global low-cost strategies and monopolistic profits clearly lead to technological progress and productivity gains in developed countries. However, if we analyze the underlying mechanisms of their factor flows in a global scenario, it is clear that the misunderstanding of structural factors as technological progress is an important aspect that has been overlooked in total factor productivity analysis, which is widely used in mainstream economics. Therefore, it is necessary to focus on the structural factors inherent in technological progress in order to correct the resulting bias and misinformation.

The British scholar John Smith, analyzing the costs and profits of three typical commodities worldwide- the iPhone, T-shirts, and coffee- outlines the problems caused by the global outsourcing phenomenon as the 'GDP illusion': the 'value captured' by the more powerful in international transactions is measured as the "value added" of domestic production in rich countries(Smith 2012)). Based on this analysis, the large trade imbalance between the US and China contains a great deal of value captured by the US from China. China participated in outsourcing and global value chains, exporting a lot of processed and assembled products for very low employee compensation and processing fees. However, according to the gross trade statistics, exports are calculated based on the gross value of exported products, which numerically overstated China's exports to the US, creating a huge trade imbalance between the two countries. The mainstream economics profession has little interest in this critique, probably because it overturns the legal basis of all 'Monetary Indicators'. Yet, even if analyzed on the basis of existing valuations, it is sufficient to reveal the implicit bias in international economic relations.

4. Key Implications of NFI Analysis for China's National Power and National Situation

4.1. Emerging economies need to beware of possible misleading of GDP in economic measurement and national power comparison

GDP is still an internationally accepted so-called 'core' indicator and the conventional rule of international economic statistics. However, emerging economies should not accept the indicator completely and should be aware of its possible misleading on economic measurement and national power comparison. The SNA, an international statistical standard co-published by the United Nations and four other international organizations, based on the resident unit of an economy, calculates GDP from the perspective of production according to the method of gross output minus intermediate consumption. Currently, all countries around the world follow this rule to calculate their own GDP. Since GDP theoretically is the best indicator of the production scale of one country, when it is used uncritically for economic measurement or national power comparison, the different range of resident units of GDP production and the resident units of factors involved in production leads to the fact that the target units that GDP and GNI accounting do not correspond to each other exactly. Thus GDP is an production indicator rather than a good one of factor income.

For most countries, using GDP as a surrogate indicator of measuring national power, when the international flow of factors is not too frequent and not too large, and the accumulation of national power relies mainly on domestic production, the difference between GDP and GNI is not too significant. However, from the development of economy globalization in the last three decades, due to the global value chain and factors of production flows triggered by multinational corporations, especially the FDI globally searching for investment as a resource of

15 The SNA was developed from the 1940s and only released its official version in the early 1950s. The versions that have been released are 1953, 1968, 1993 and 2008, and the 2008 version is currently under revision, with the two main focuses of the revision on globalization and the digital economy.

income, as well as the distribution of production process and the prevalence of 'outsourcing', it has led to huge differences between NFI distributed in different countries and triggered an asymmetrical competition between developed and developing countries in the distribution of profits and economic growth at the global level.

Under such circumstances, if GDP is still used as an indicator of national power, on the one hand, it will conceal the global arbitrage of developed countries and then induce an illusion of economic growth in developing countries, especially for emerging economies, that the rapid economic growth resulting from the participation of extensive labor force in global production will inevitably lead to strengthening of national power. On the other hand, as emerging economies are expanding globally, it is necessary to make a more thorough analysis of the global economic structure, so that the traditional international statistical standards suitable for developed countries are no longer applicable. GDP, one of the greatest inventions of the 20th century, after the development in half a century, has not been able to adapt to the changing needs of the world today for ever-expanding economic measurement, thus emerging economies have posed new challenges and great demands on international economic statistics rules. Emerging economies should not only be passive recipients, but also participants in the elaboration and improvement of those methods and rules, which are the most essential statistical foundation to guarantee the future measurement of global economy and comparison of international affairs.

The uncertainty caused by the Covid-19 pandemic has raised higher requirements for tracking the changes in globalization and closely monitoring the impact of the pandemic on international communications. With the Covid-19 pandemic sweeping the world in 2020, a severe economic downturn and slow recovery have occurred in every country. The pandemic's evolution and its consequences are still under great uncertainty. There is an urgent need for national statistical authorities in emerging economies to closely track and monitor global developments trends and their influence, and to study such measures to reduce the negative impact of the pandemic and the retrograde of globalization.

Taking China as an example to look at the development of emerging economies, from the external environment, the Chinese market has become a major platform for the growth of global corporations of various industries in 2020, which is a "safe harbor" for multinational companies and a key engine for their growth; in addition, China's FDI grew against the trend in 2020, replacing the US as the world's largest FDI inflow country, achieving a triple increase in the total amount of FDI, the growth rate and the global proportion. From the domestic environment, China's strategy of smooth national economic circulation to build a new development pattern in response to the pandemic focuses on domestic demand and adopts parallel domestic and international circulations model to improve the adaptability of the supply system to domestic demand. This new development pattern provides vast market opportunities worldwide and has become a huge gravitational field for attracting international commodities and factor resources.

For emerging economies, the current external environments and internal situations, not only from the production side but also from the income side, have pushed them into the upward path to become the major economies in the world. However, GDP as a measure of production is not sufficient to provide evidence for emerging economies to evaluate international cooperation and competition. They require GNI reflecting the real situation of a country's factor income capacity (i.e., national power), and NFI reflecting international factor income capacity to fully represent the dynamic changes in international investment and factor markets.

4.2. The critique of GDP lacks the perspective of the applicability of countries' types

Recent critiques of GDP are mainly focused on welfare measures (Jorgenson et al. 2014) , lacking deeper consideration of its applicability to emerging economies. The 2009 report of the Commission on the Measurement of Economic Performance and Social Progress (also known as Stiglitz-Sen-Fitoussi (SSF) Commission) of the Organization for Economic Co-operation and Development (OECD) on economic measurement (Stiglitz et al.

2009)emphasizes the importance and contribution of welfare accounting, clarifies the synergistic between economic theory and statistical measurement, and indicates that statistical practice and its real-world results are often based on a large number of assumptions. The measurement influences people's behavioral decisions, and what is ignored by the measure leads people to ignore the existence of certain aspects. Following up on the work of 2009, in 2018, the High-Level Expert Group on the Measurement of Economic Performance and Social Progress (HLEG), led by Stiglitz, Fitoussi and Durand, after five years of research, published two reports, titled Beyond GDP: Measuring What Counts for Economic and Social Performance16 and For Good Measure: Advancing Research on Well-being Metrics Beyond GDP17, discussing global salience issues over the period 2013-2018 (Stiglitz et al. 2018a, 2018b). The report argues that GDP is a single indicator that shows the output of a market economy and a substitute indicator that shows both economic and comprehensive welfare, while GDP is not designed to carry out such a function; thus, GDP needs to be complemented. Other broader indicators are needed to reflect the distribution of social welfare and its sustainability across social, economic and environmental dimensions. In 2015, the United Nations Sustainable Development Goals(SDGs), approved unanimously by the international community, designed 169 policy goals and more than 200 Global Monitoring indicators to be an improvement on the critique of Beyond GDP.

However, the work undertaken by international organizations represented by developed countries does not critique GDP from a generalized perspective (i.e., the applicability of different countries' types), which is very important for emerging economies. This is because the development is extremely unbalanced between developing and developed countries, being reflected in various aspects such as statistical capacity, economic structure and technological innovation capacity. In particular, emerging economies have an increasing share of the global economy, and there is quite a big change in the global economic structure. Thus, the foundation of economic statistics for emerging economies becomes extremely important for evaluating current global issues such as climate change, global income distribution, poverty and so on. If we lack consideration for the emerging economies and fail to reflect the important global impact of the data quality of these countries, the existing critique and improvement of various measures of GDP according to international statistical standards are still essentially maintaining the profit pattern dominated by developed country, with the arbitrage between the two types of countries based on the existing division of labor leading to further widening of the real development disparity. While a general promotion of welfare measurement is needed, it also ignores the new features of international economic relations brought about by globalization.

4.3. Economic statistics is one of the important foundations for high-quality development

High-quality development requires improving national governance capacity and soft power. Emerging economies are the advanced players in developing countries, which often focus on physical infrastructure in the early stage of development. After entering the stage of high-quality development, social infrastructure, representing the soft power of the country, becomes the key to improve the development quality (Qiu and Wang 2020). However, when the initial development focusing on growth rate, it usually tend to neglect the construction of social infrastructure. From the perspective of economic statistics, the key issues of national interests such as international disputes, national economic security and international competition, require reliable economic measurement, national accounting and international comparison methodologies and economic statistics data as basic support. Therefore, emerging economies should build social infrastructure just as they build physical infrastructure, for

16 Stiglitz, J. E., J.-P. Fitoussi, and M. Durand. 2018a. *Beyond GDP: Measuring What Counts for Economic and Social Performance*. Paris: OECD Publishing.

17 Stiglitz, J. E., J.-P. Fitoussi, and M. Durand. 2018b. *For Good Measure: Advancing Research on Well-being Metrics Beyond GDP*. Paris: OECD Publishing.

instance, highways and high-speed railroads, of which effective economic statistics is one of the most important parts.

Regarding China's economic statistics, the US-China trade friction should be the trigger for further consideration of the construction of its social infrastructure. The development of economic statistics in China has not yet been matched the rapid economic growth. As an important part of social infrastructure construction, the methodological framework of economic statistics still has a long way to go to meet the local adaptability and statistical practices in China. There are still many major economic issues in the process of socioeconomic development lacking solid and reliable economic statistics to support them. In the case of US-China trade friction, the crucial and fundamental questions to be answered by economic statistics should at least include: What is the exact trade imbalance between the US and China? What is the impact on China's industrial chain? What is the impact of trade wars at different levels on the Chinese economy? What is the trade imbalance between China and Europe, China and Japan, as well as China and Korea, etc., and if there is a trade conflict, what is the estimated impact on the Chinese industrial chain? What exactly is economic strength of China? How does it compare with the strength of major economies such as the US, Europe and Japan? All these questions deserve to be studied systematically, substantively and continuously. Without reliable and solid economic statistics data, arguments in international affairs will not be supported by evidence.

Professional analysis of economic statistics helps to confirm China's current status as a developing country. The determination of whether a country is a developing country cannot be based solely on GDP. The question of which indicators should be used is essentially a professional subject of socioeconomic statistical measurement, and the according monographic study should be carried out and then to build an indicator framework. Such a measurement extension can also be used to respond to the pressure exerted by developed countries on praising China. However, there are some misconceptions that need to be clarified. For example, with the process of economic globalization, traditional concepts such as made in certain country, manufacturing power and world factory, have been greatly reduced and are not very meaningful for evaluating the national situation correctly, and even be misleading. From a professional perspective of economic statistics, detailed, high-frequency analysis of supply and use tables classified by industries and products are needed to accurately determine the pattern of global production chains, supply chains, value chains and wealth chains and their trends, and then to understand the real contribution of emerging economies in them. The impact of international trade conflicts on the emerging economies cannot only focus on their GDP, but also countries need to take a dynamic rather than static perspective, particularly focusing on chain-breaking effects.

Recent years, China has become a major economy on economic turnover in the world, and accordingly needs to increase its voice in the formulation and revision of international economic statistics rules, for example, by replacing the gross value approach with the value added approach for calculating the international trade balance. Therefore, the availability of high-level international economic statistics experts is one of the most important measures to enhance national governance and soft power in a strategic layout.

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Conflict of interest

All the authors claim that the manuscript is completely original. The authors also declare no conflict of interest.

Author contributions

Conceptualization: Dong Qiu; Investigation: Dong Qiu, Yafei Wang; Methodology: Dong Qiu. Yafei Wang; Formal analysis: Yafei Wang; Writing – original draft: Dong Qiu, Yafei Wang; Writing – review & editing: Dong Qiu, Yafei Wang.

Appendix

Appendix A. Major Global NFI Surplus and Deficit Countries

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1. NFI Surplus Countries

1.1. Major Developed Countries

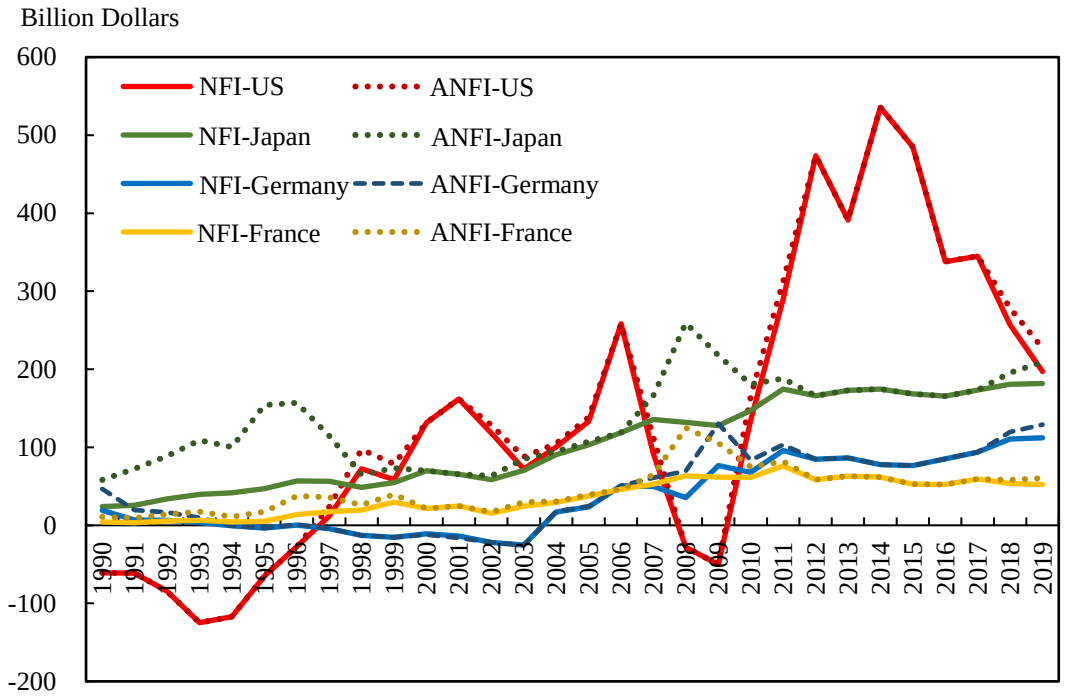


Figure A.1. Trends of NFI in Major Developed Countries, 1990-2019.

1.2. Stable Developed Countries

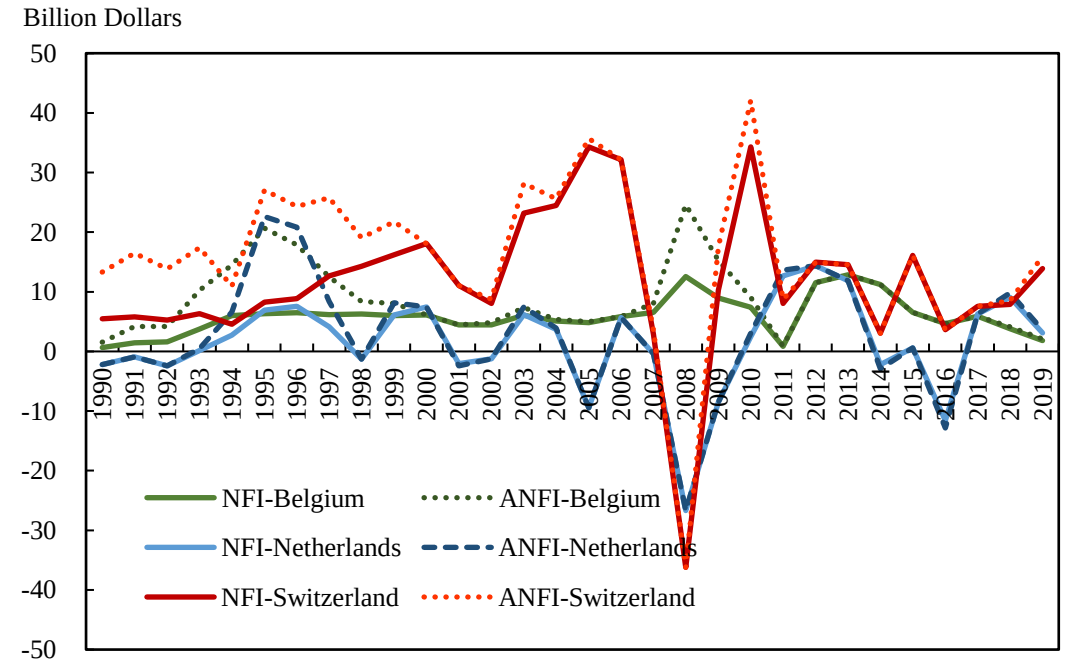


Figure. A.2. Trends of NFI in Stable Developed Countries, 1990-2019.

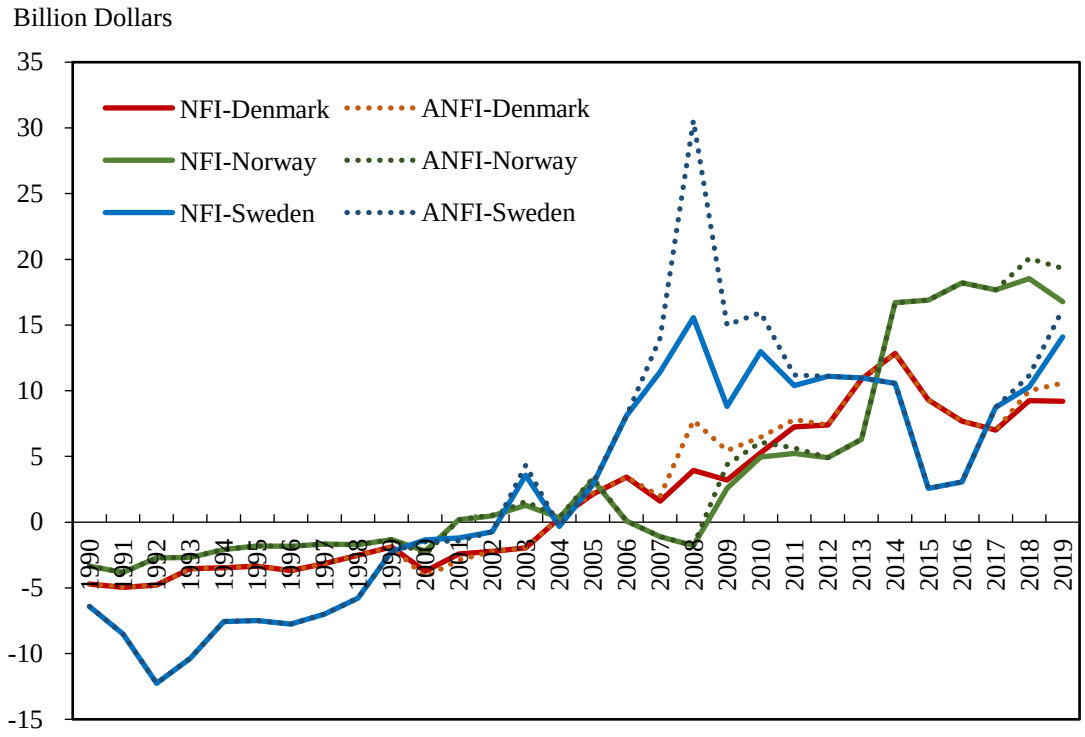


Figure. A.3. Trends of NFI in Stable Developed Countries, 1990-2019.

1.3. Oil-rich Countries

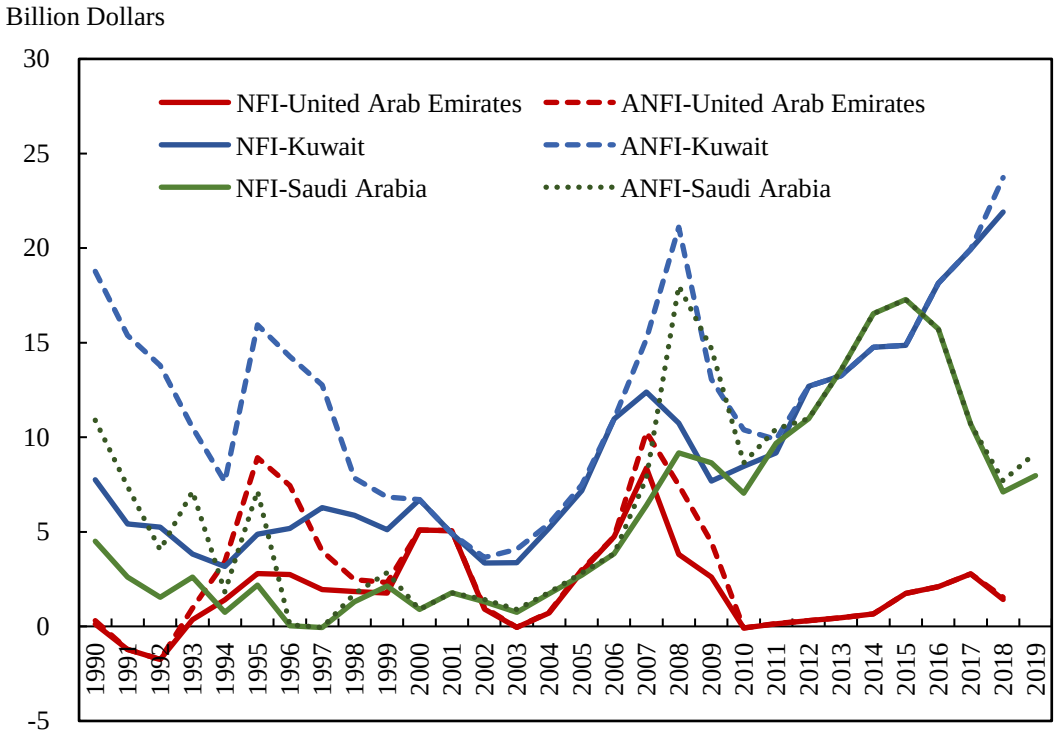


Figure. A.4. Trends of NFI in Oil-rich Countries, 1990-2019.

1.4. Labor-intensive Countries

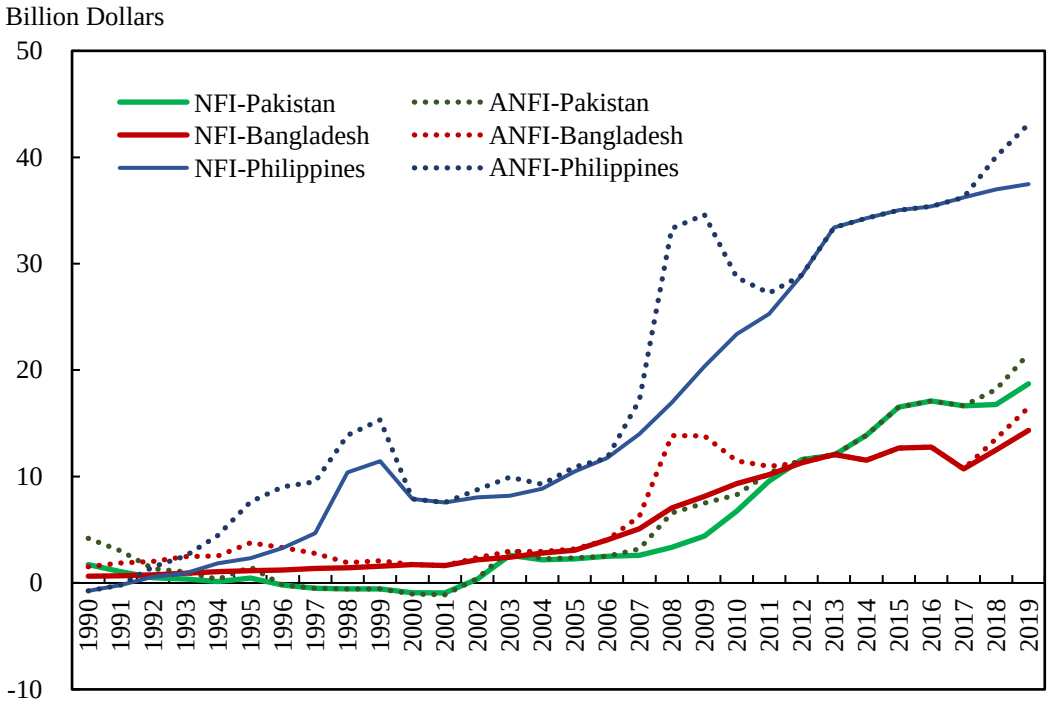


Figure. A.5. Trends of NFI in Labor-intensive Countries, 1990-2019.

1.5. Special Economies

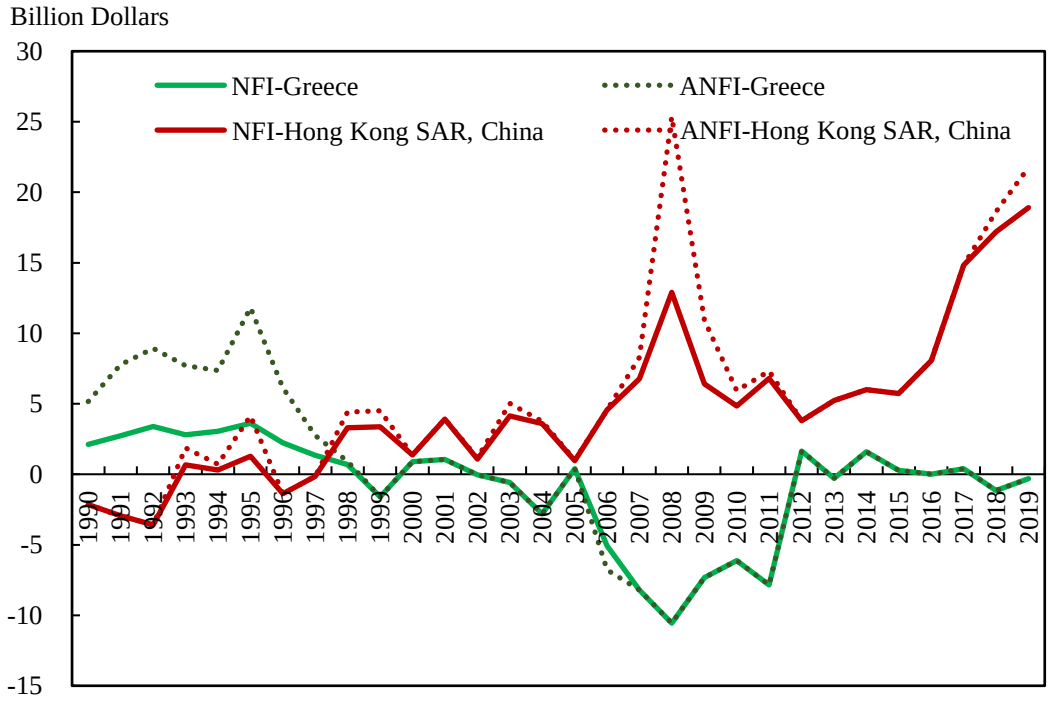


Figure. A.6. Trends of NFI in Special Economies, 1990-2019

2. NFI Deficit Countries

2.1. Emerging Economies in Asia

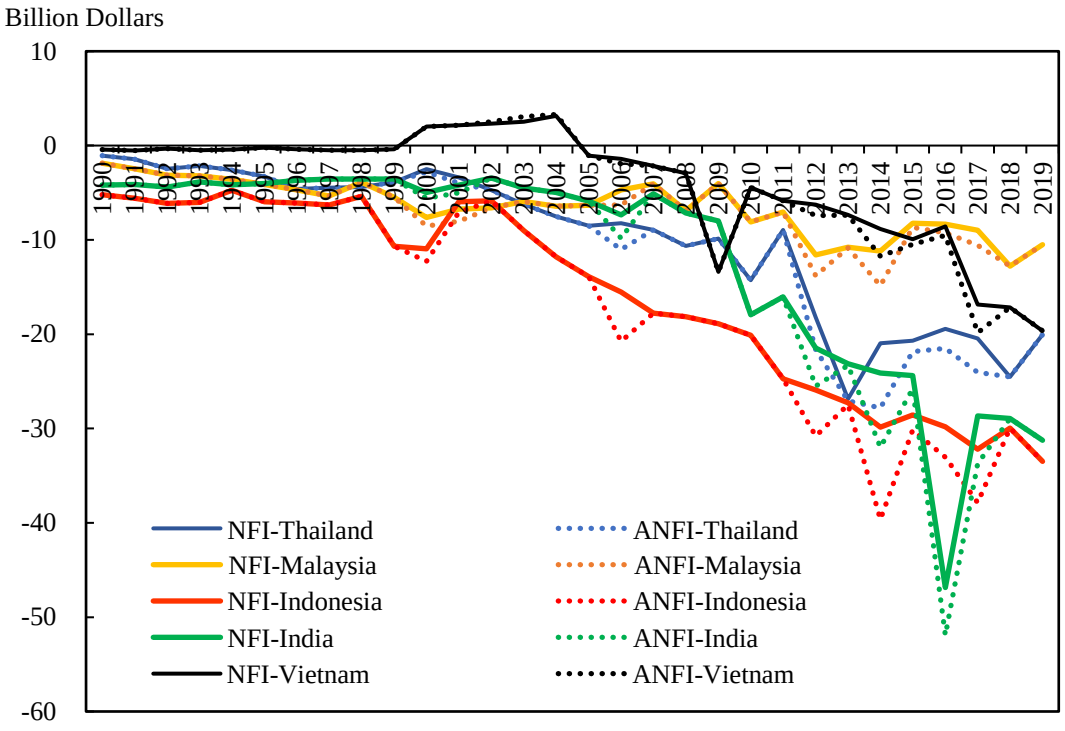


Figure. A.7. Trends of NFI in Emerging Economies in Asia, 1990-2019.

2.2. Emerging Economies in Latin America

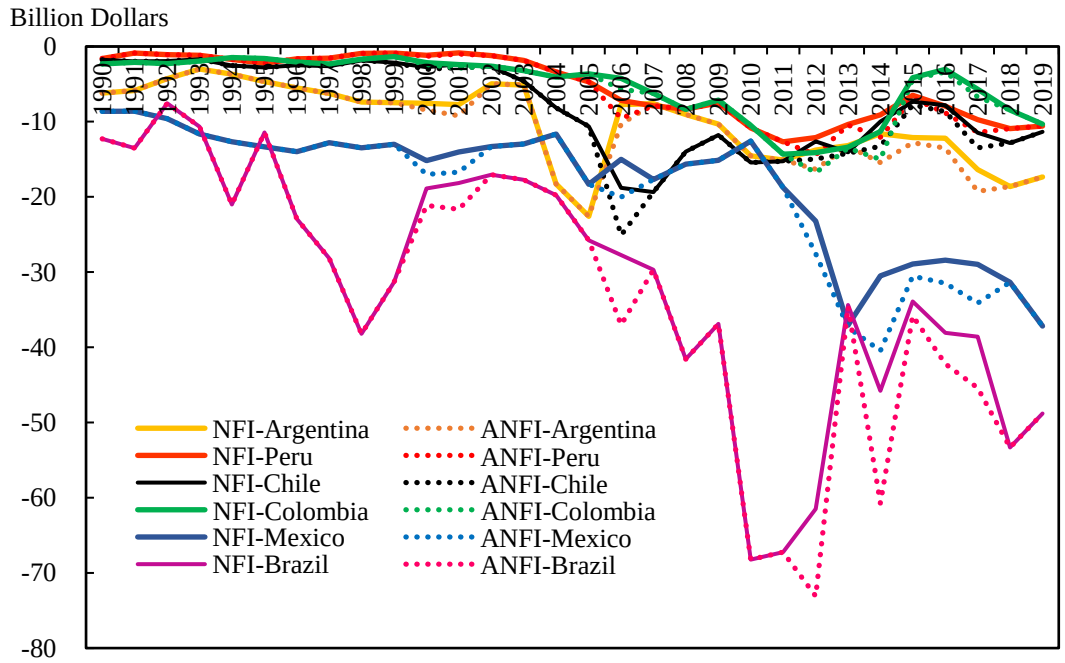


Figure. A.8. Trends of NFI in Emerging Economies in Latin America, 1990-2019.

2.3. Emerging Economies in Africa

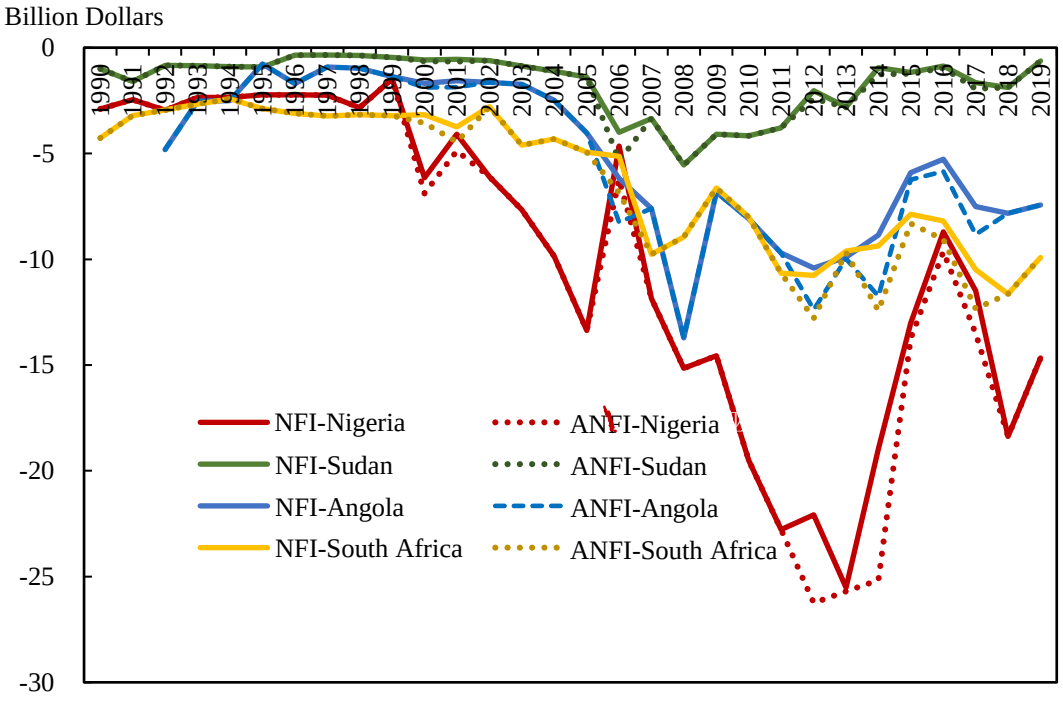


Figure. A.9. Trends of NFI in Emerging Economies in Africa, 1990-2019.

2.4. Emerging Economies in Eastern and Central Europe

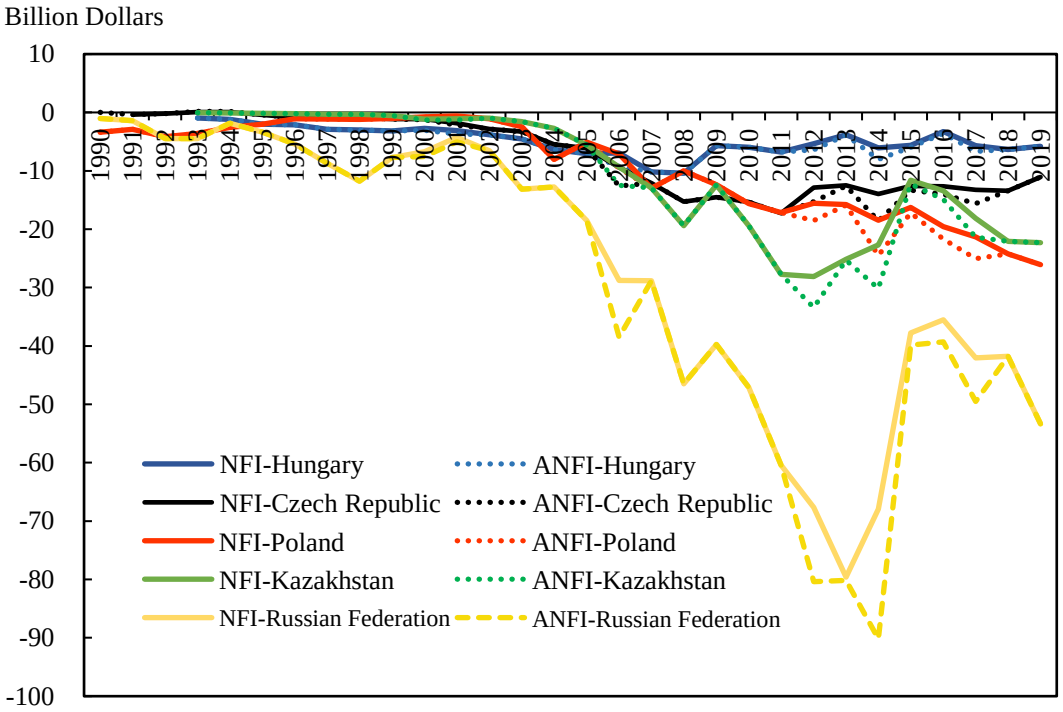


Figure. A.10. Trends of NFI in Emerging Economies in Eastern and Central Europe, 1990-2019.

2.5. OECD Persistent NFI Deficit Countries

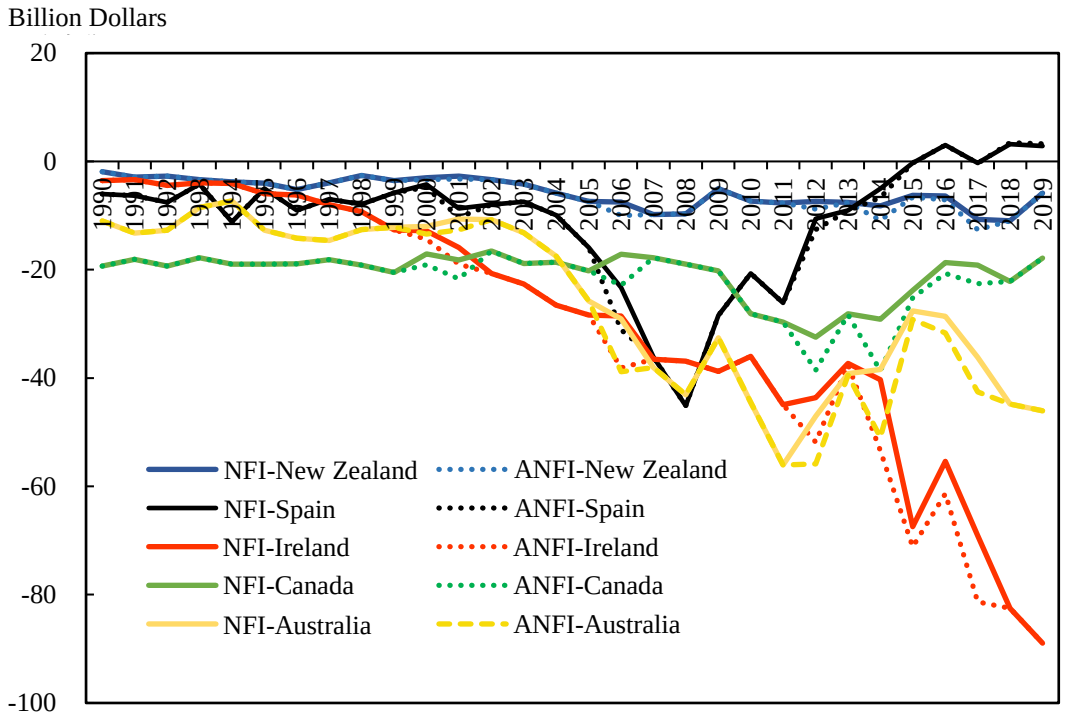


Figure. A.11. Trends of NFI in OECD Persistent NFI Deficit Countries, 1990-2019.

2.6. OECD Fluctuating NFI Countries

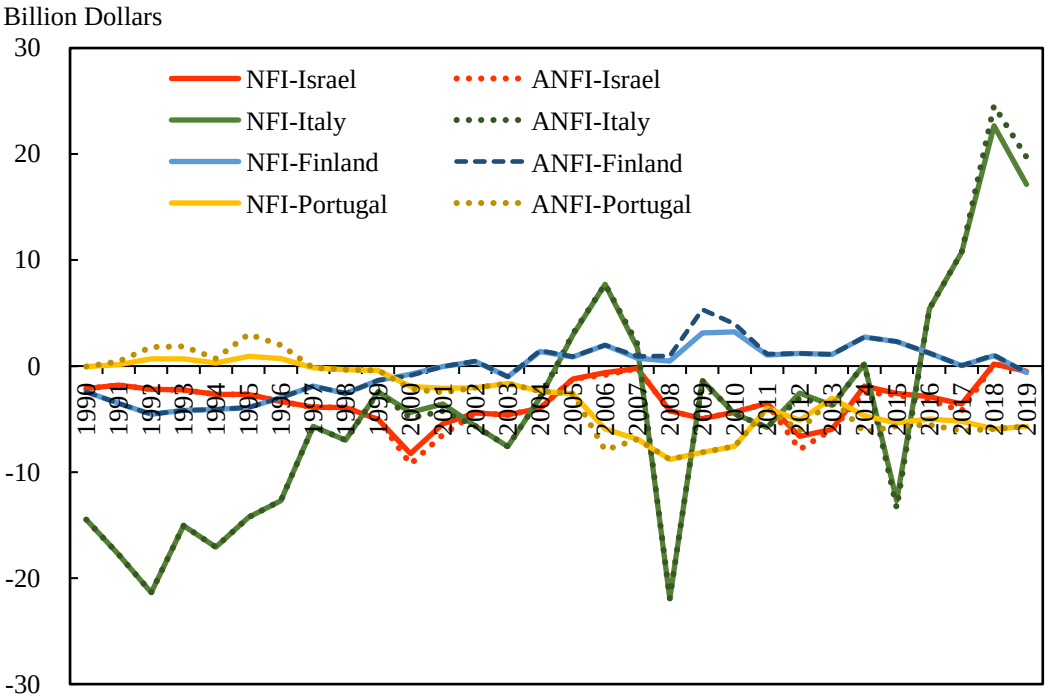


Figure. A.12. Trends of NFI in OECD Fluctuating NFI Countries, 1990-2019.

2.7. Special Economies

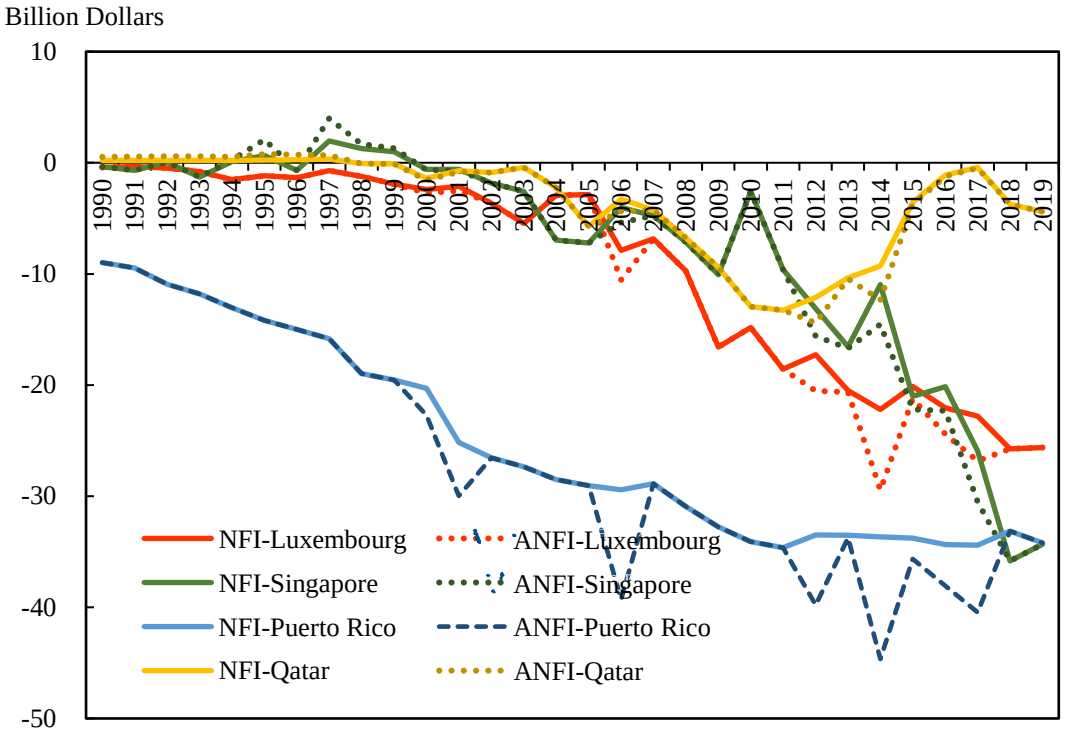
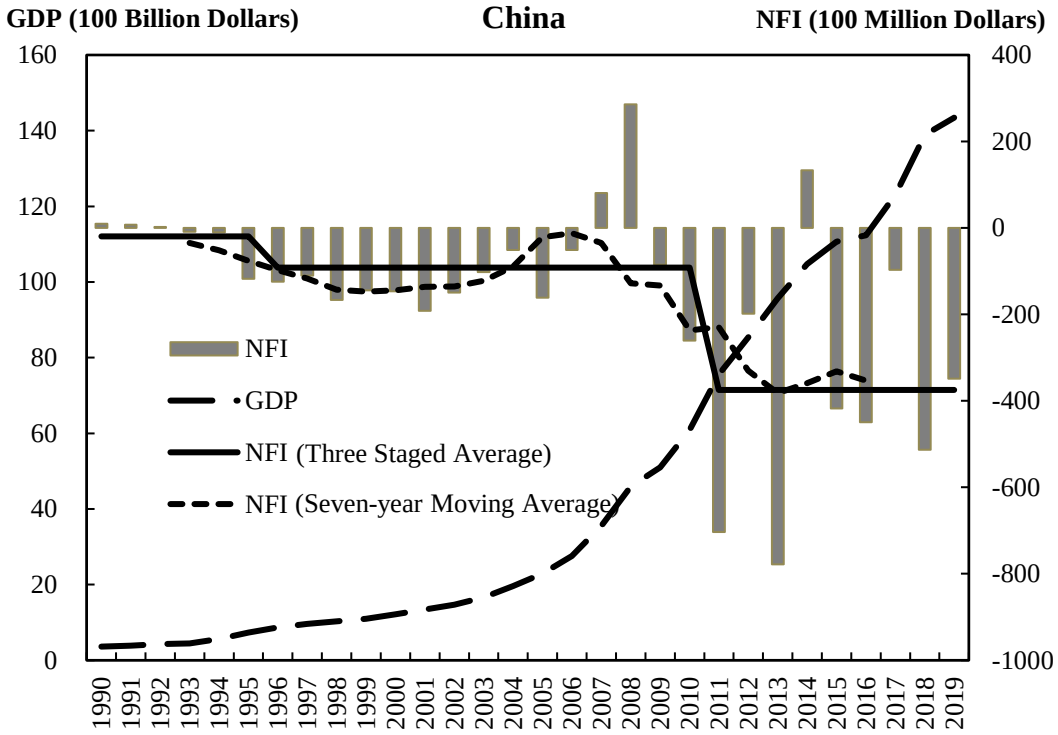


Figure. A.13. Trends of NFI in Special Economies, 1990-2019.

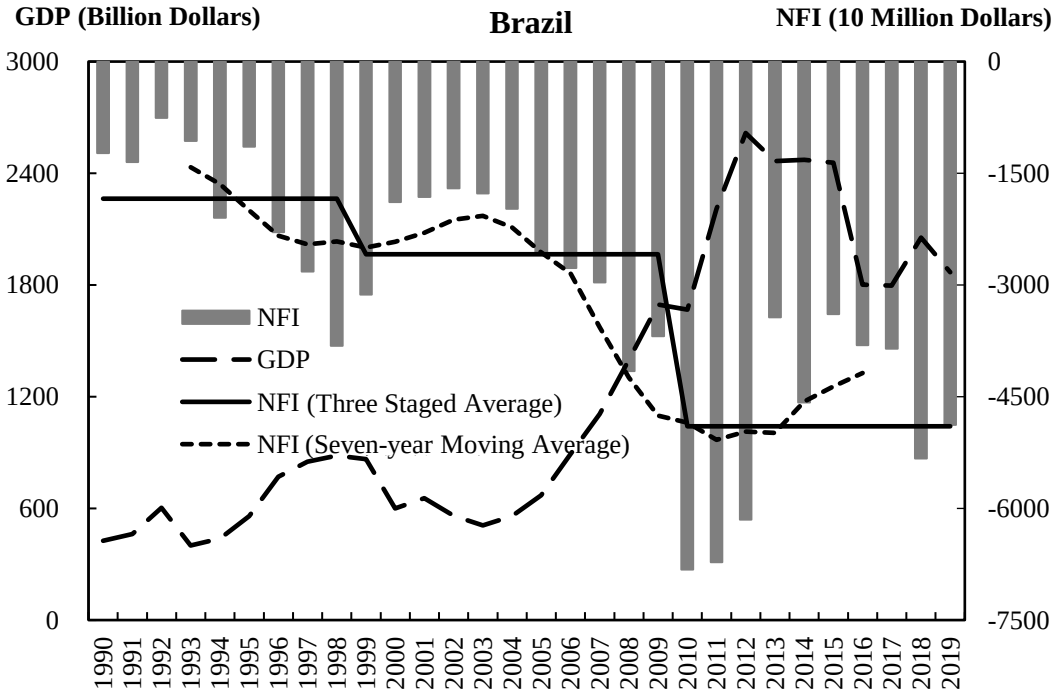
Appendix B. Trends in NFI and GDP of Major Global Deficit Countries

1. China 27
2. Brazil 27
3. Russian Federation 28
4. Australia 28
5. Italy 29
6. Spain 29
7. Ireland 30
8. India 30
9. Canada 31
10. Mexico 31
11. Indonesia 32
12. Thailand 32
13. Nigeria 33
14. Argentina 33
15. Poland 34
16. Chile 34
17. Puerto Rico 35
18. Kazakhstan 35
19. Czech Republic 36
20. Singapore 36
21. Vietnam 37
22. Luxembourg 37
23. Sudan 38
24. South Africa 38
25. Malaysia 39
26. Colombia 39
27. Peru 40
28. Angola 40
29. Hungary 41
30. New Zealand 41
31. Finland 42
32. Portugal 42
33. Israel 43
34. Qatar 43

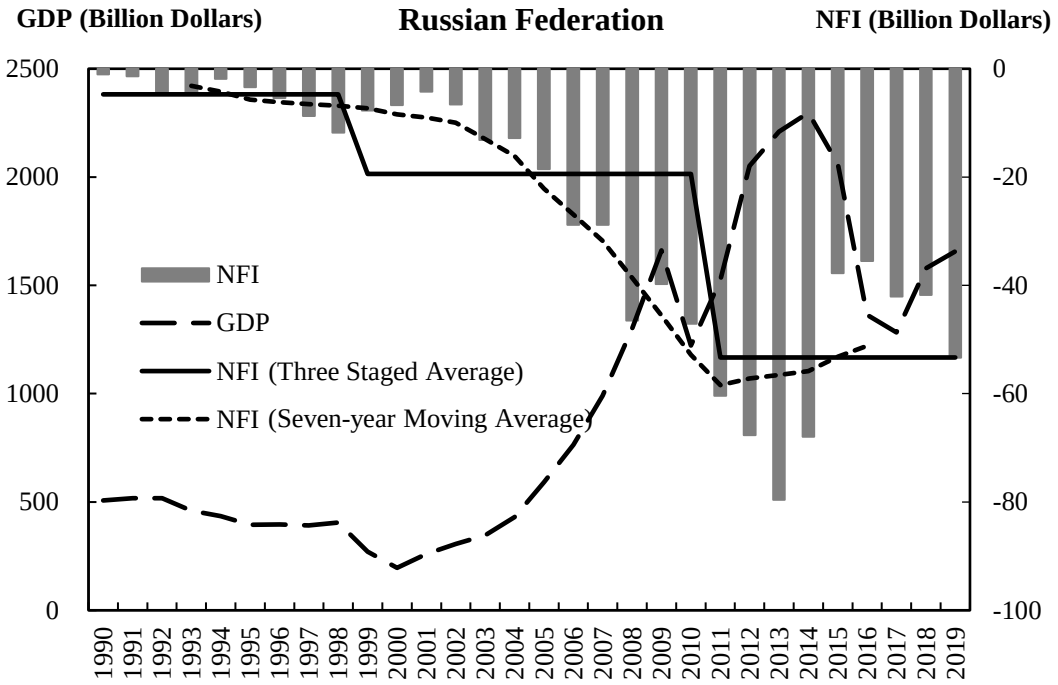
1. China



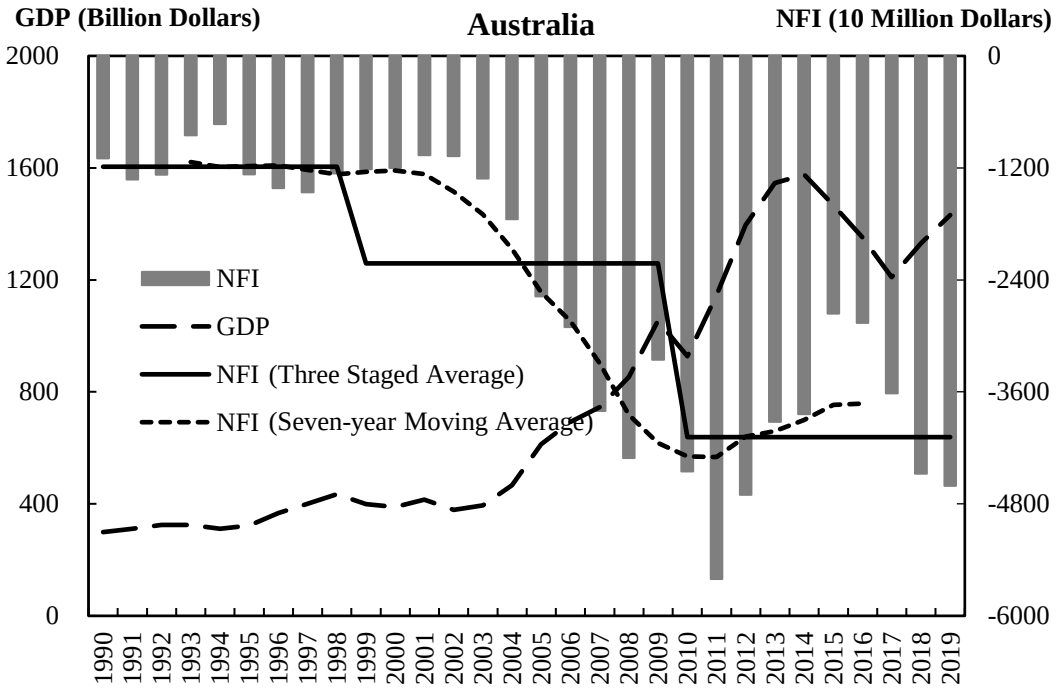
2. Brazil



3. Russian Federation



4. Australia



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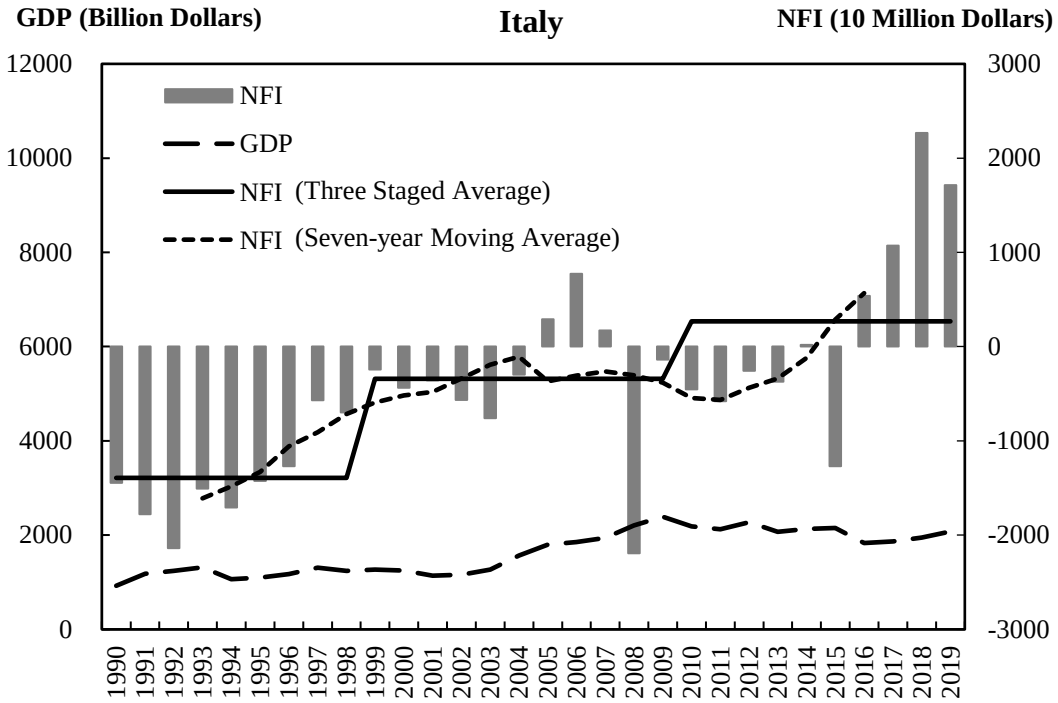

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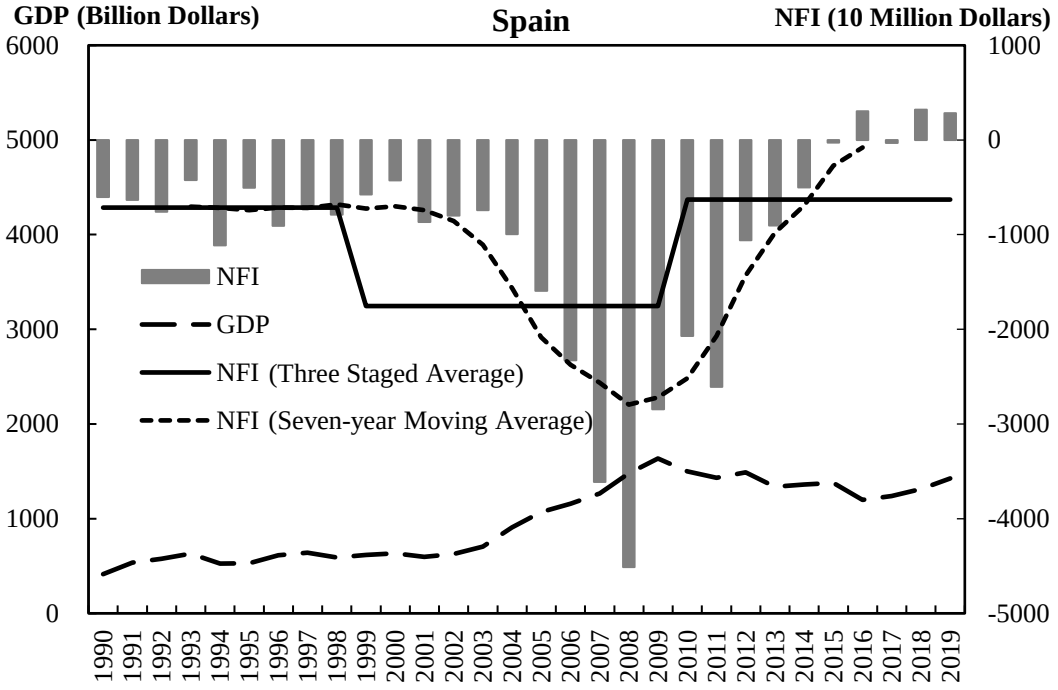

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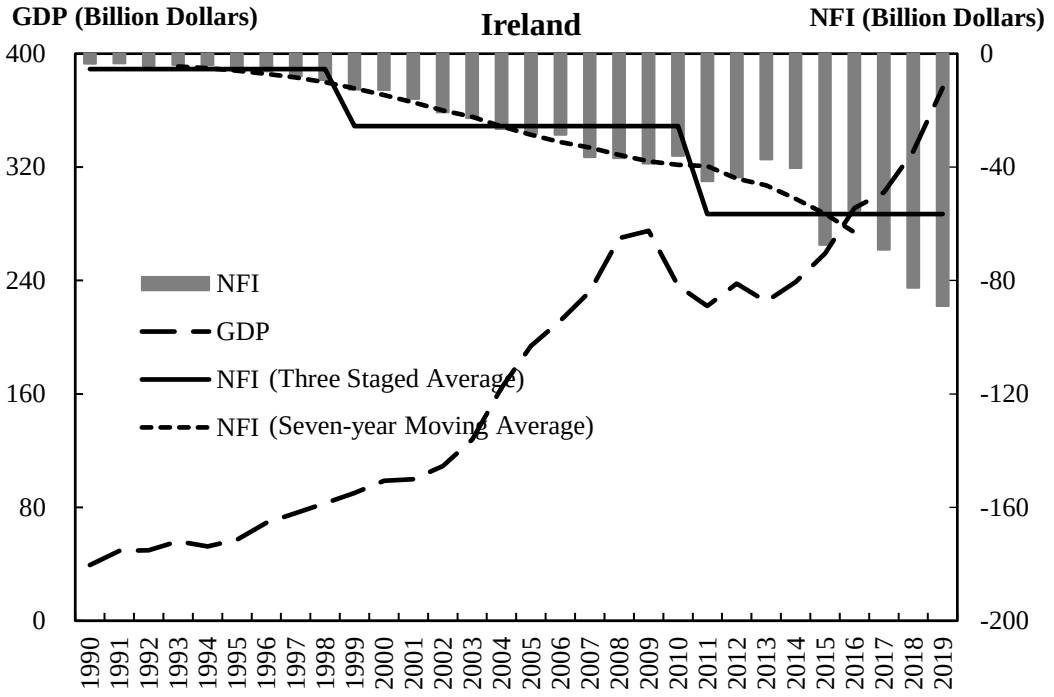

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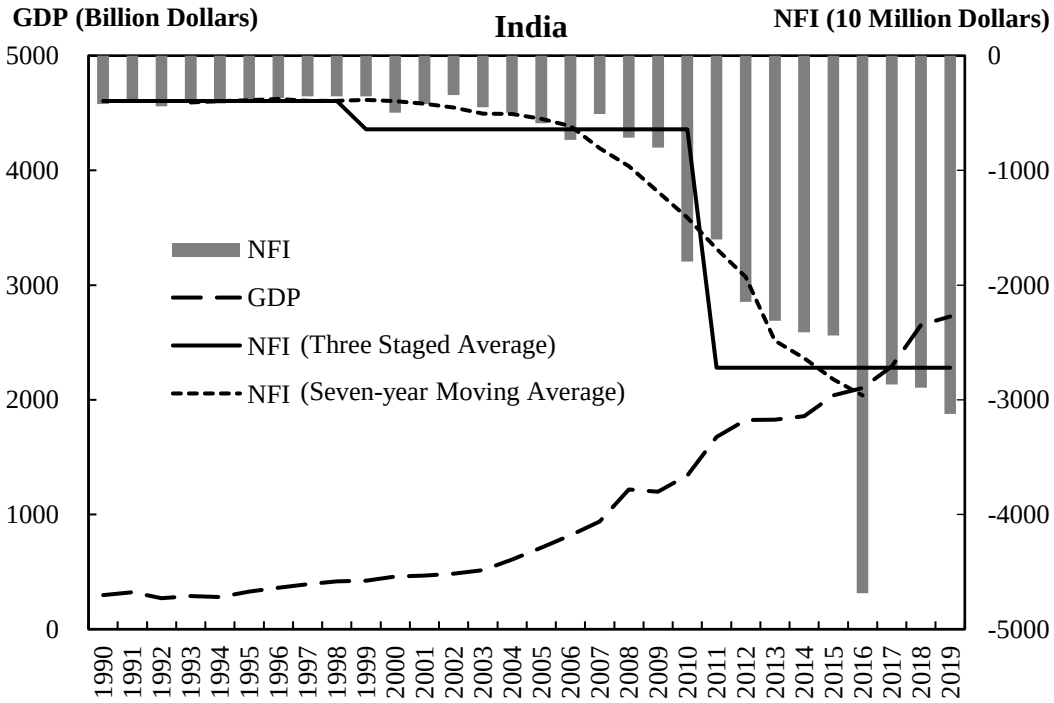

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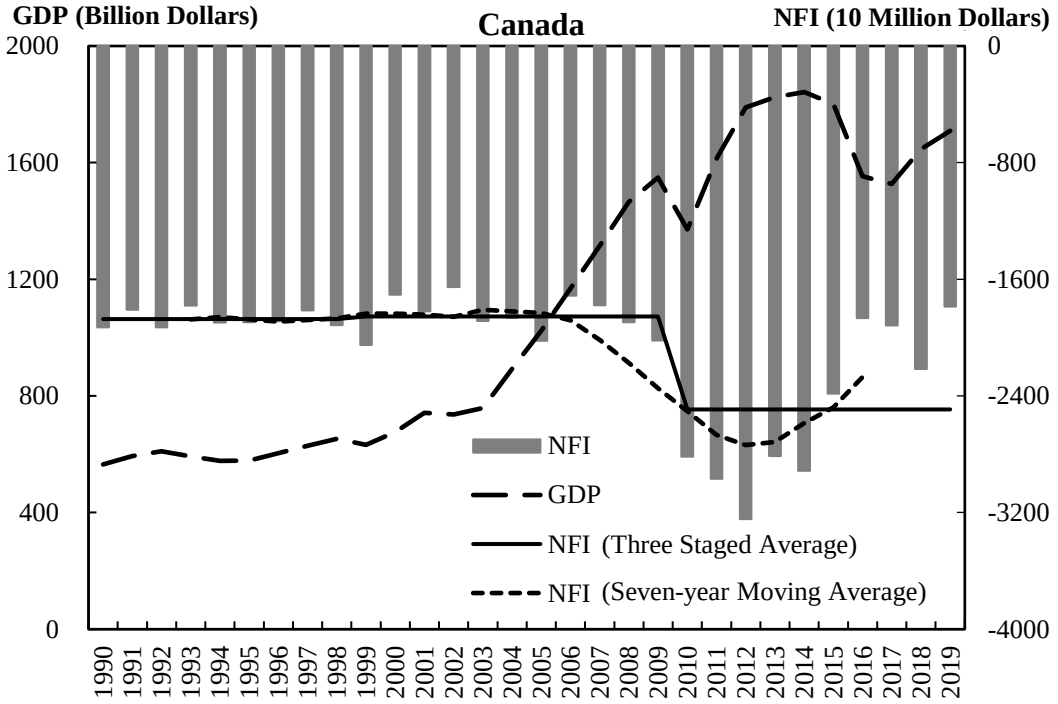

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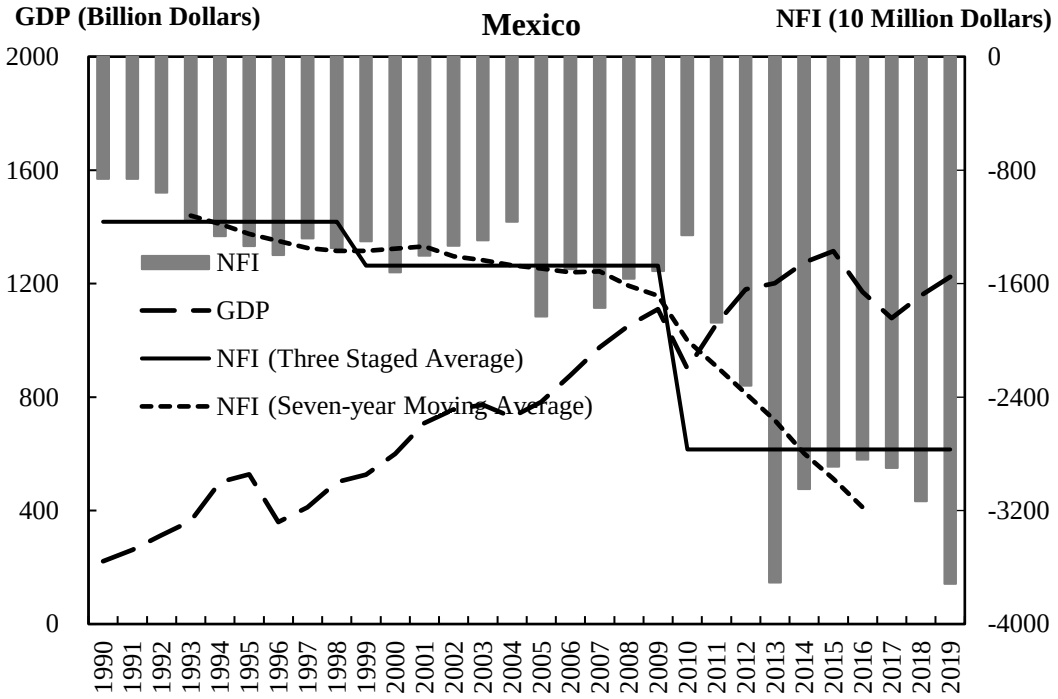

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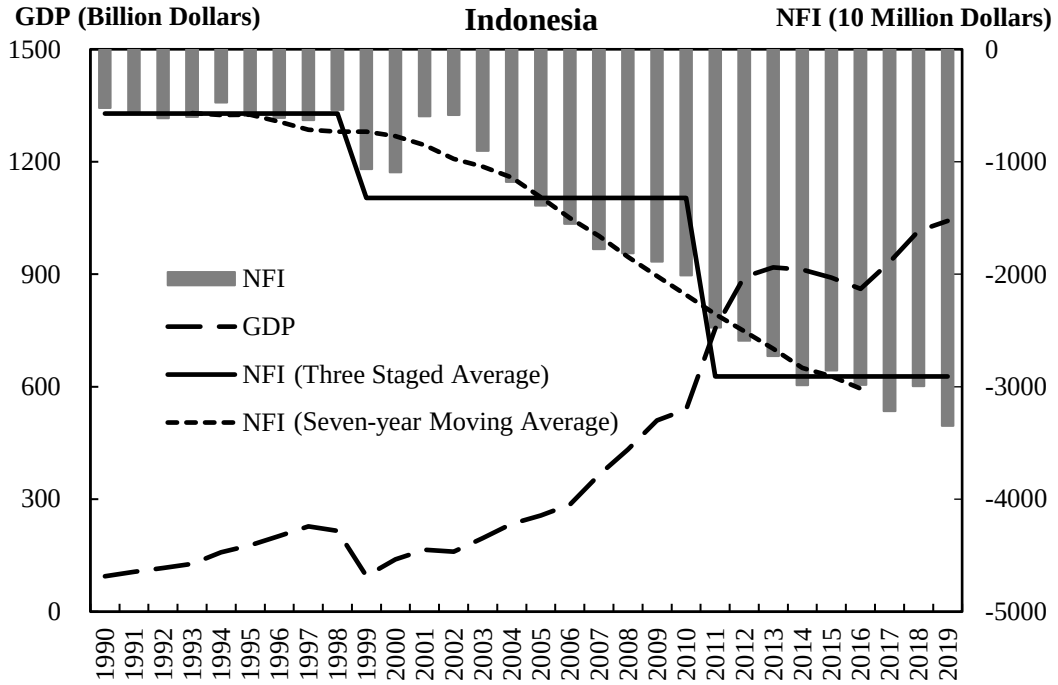

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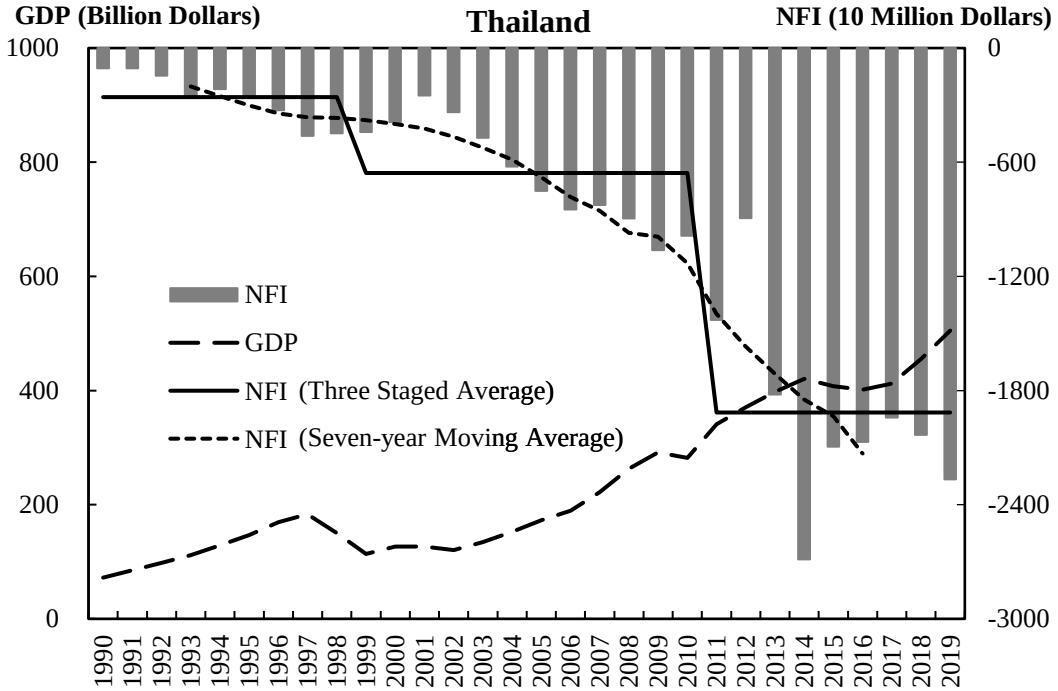

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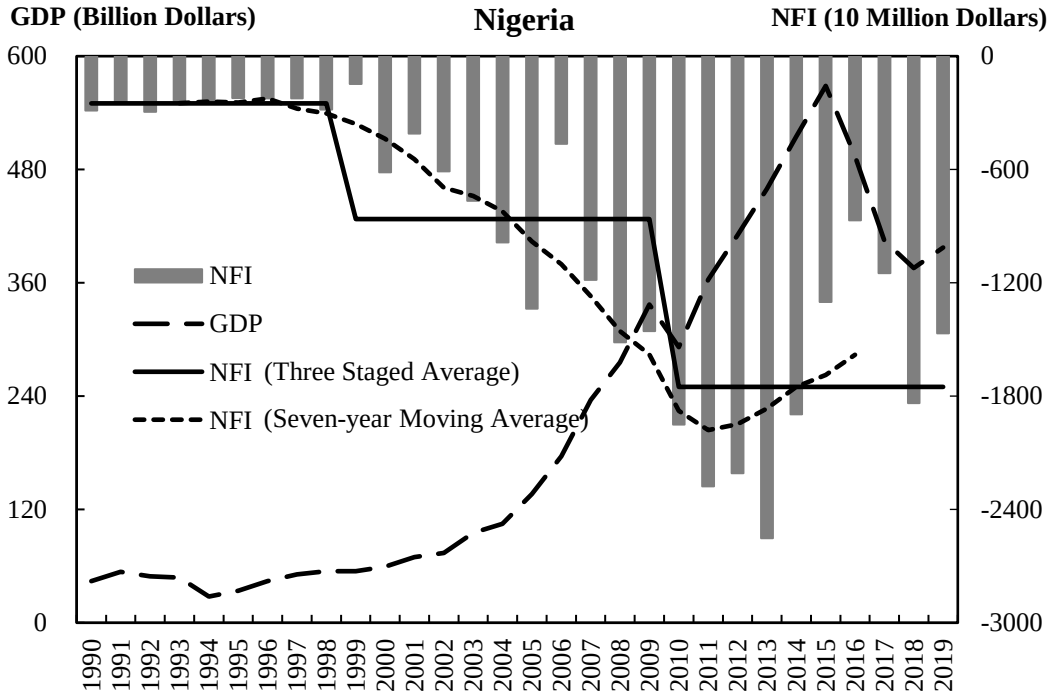

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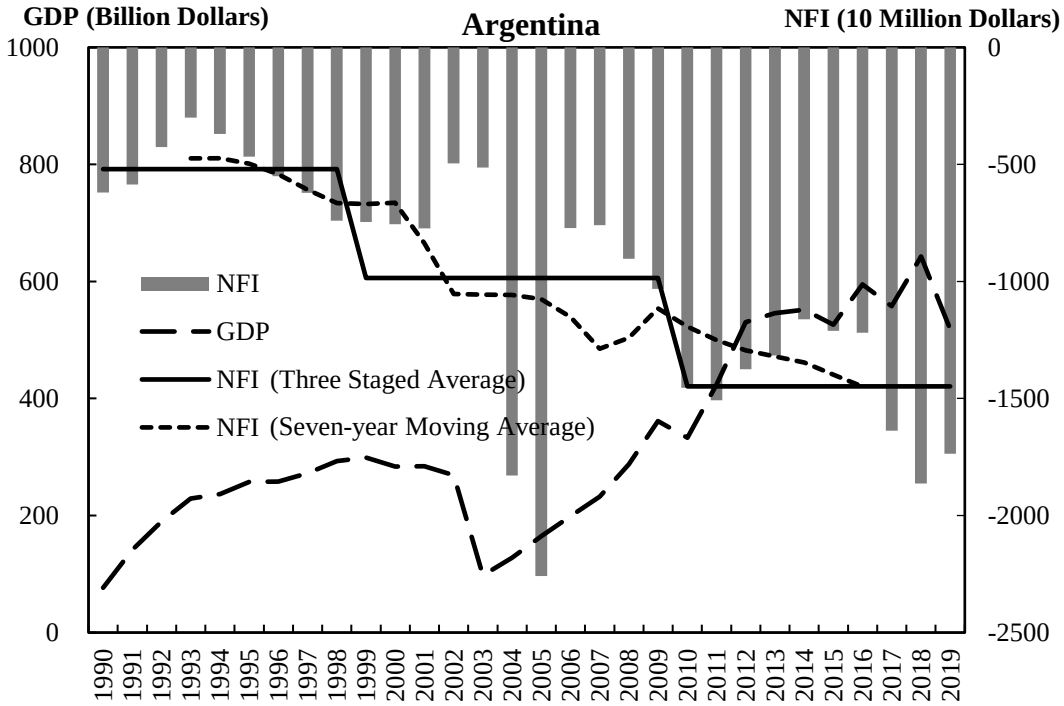

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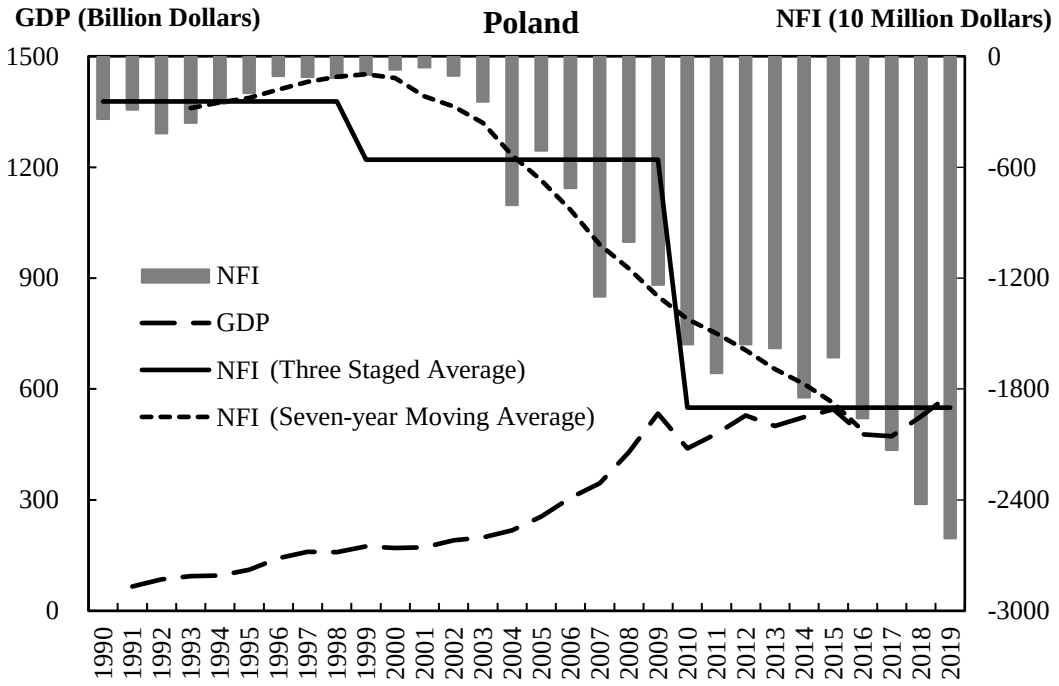

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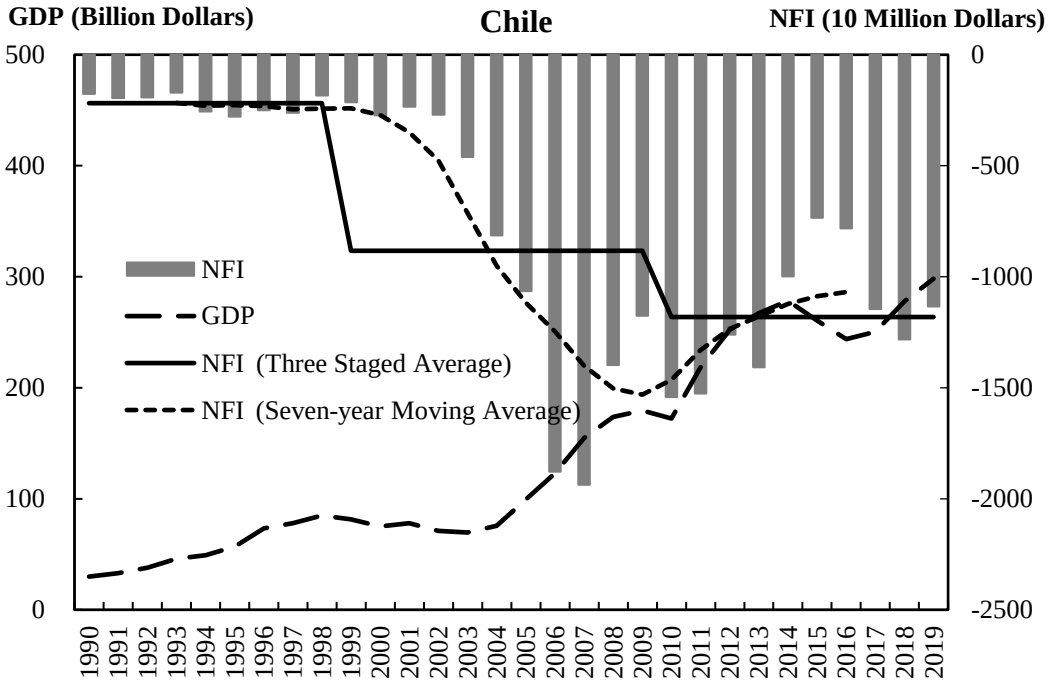

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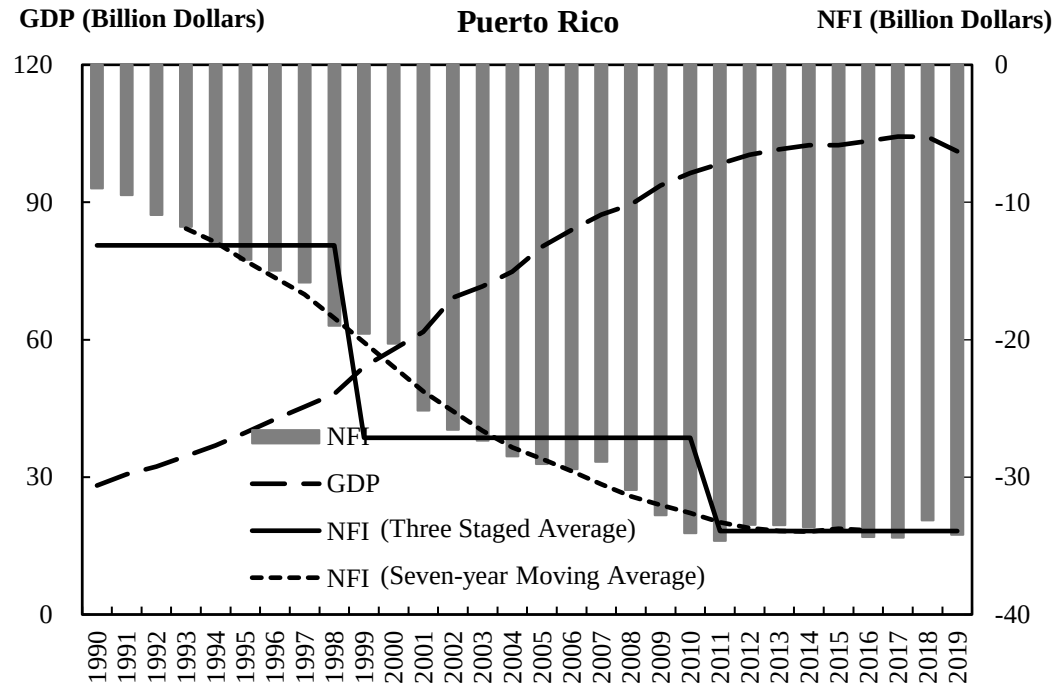

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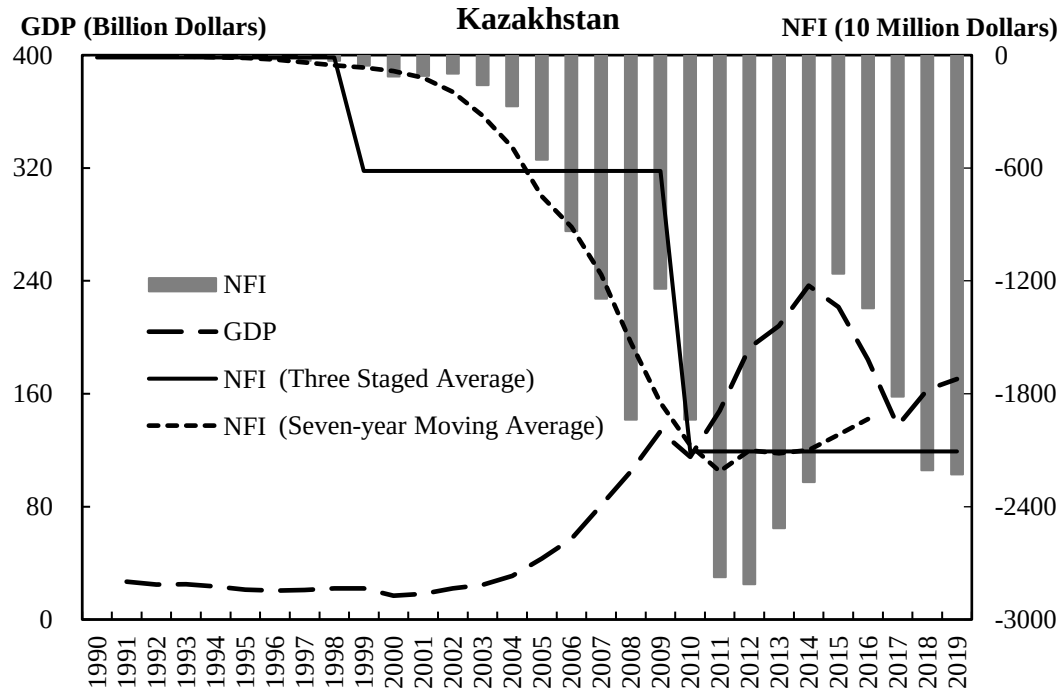

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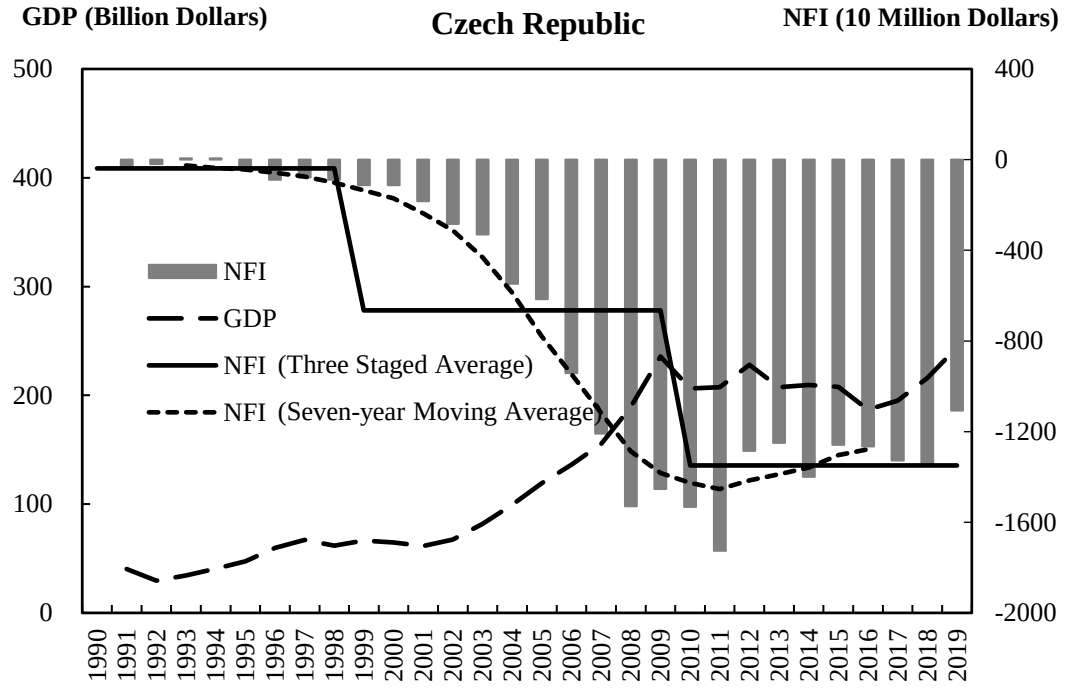

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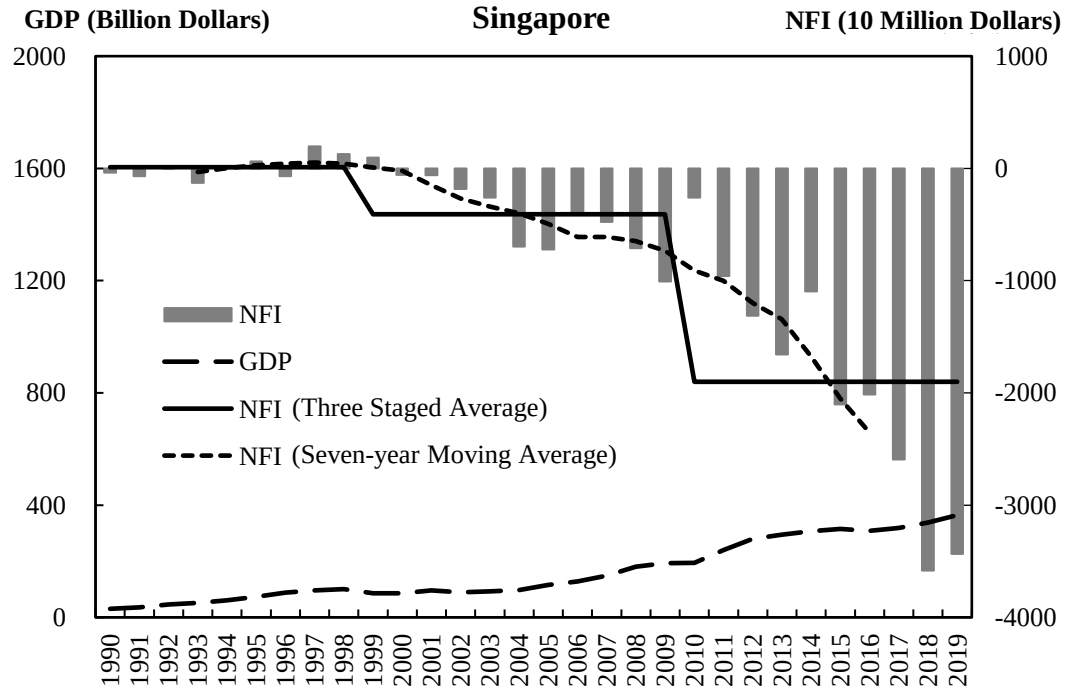

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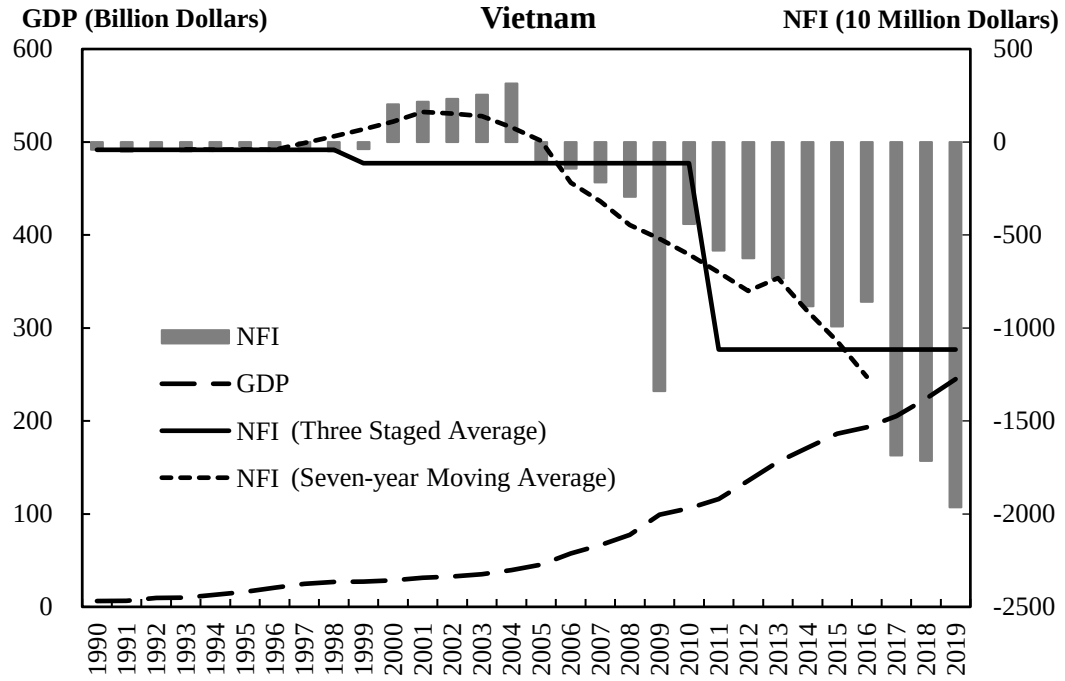

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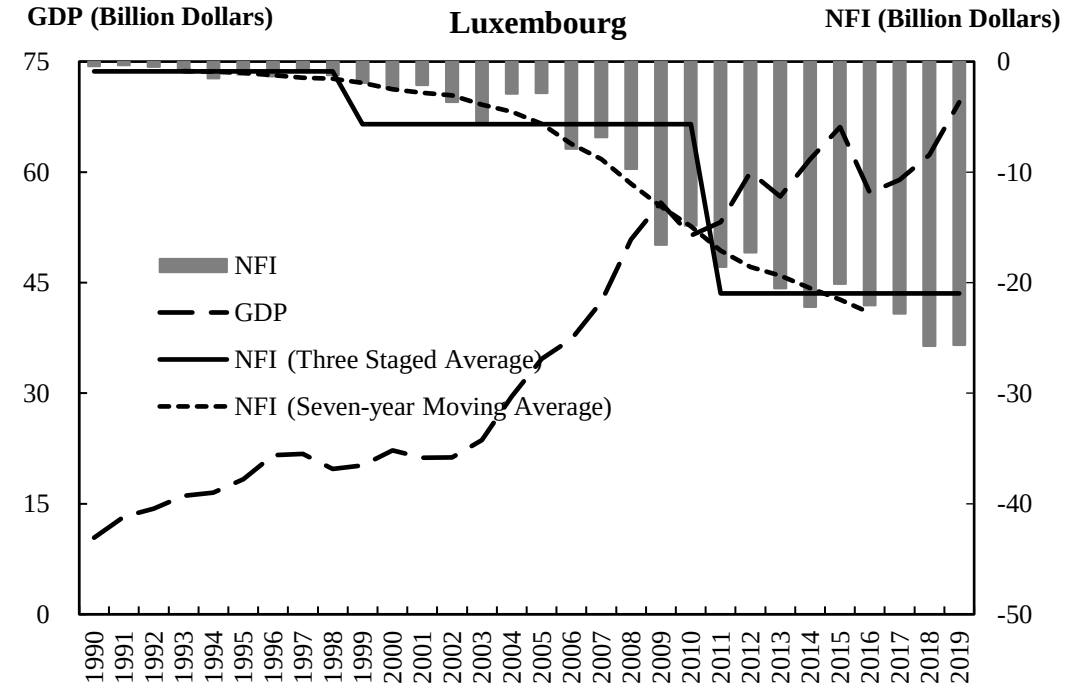

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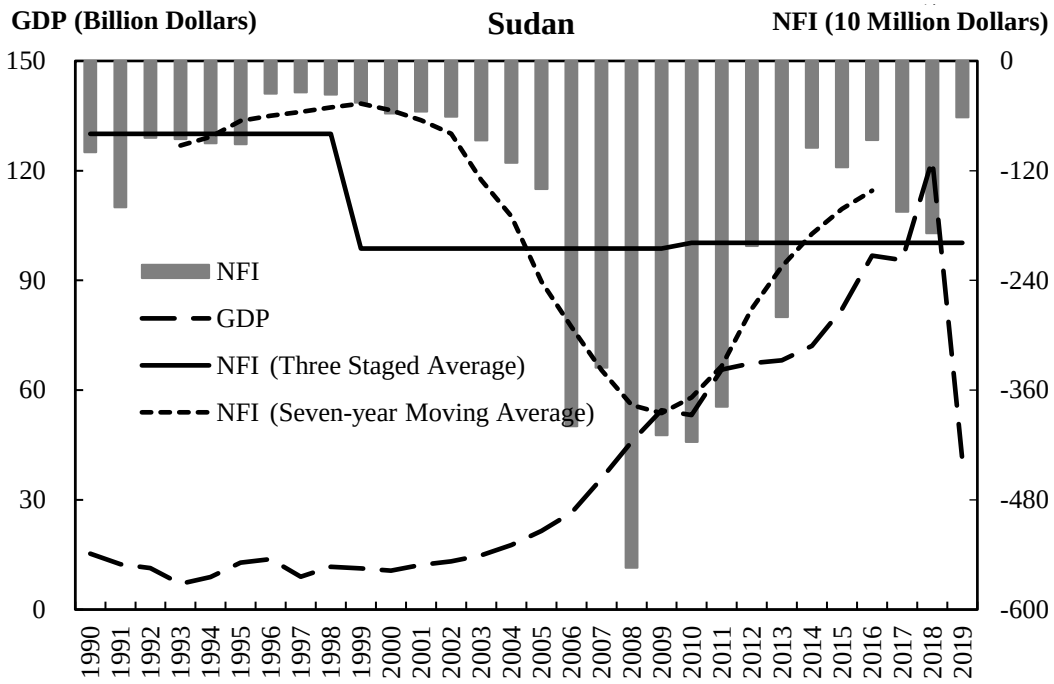

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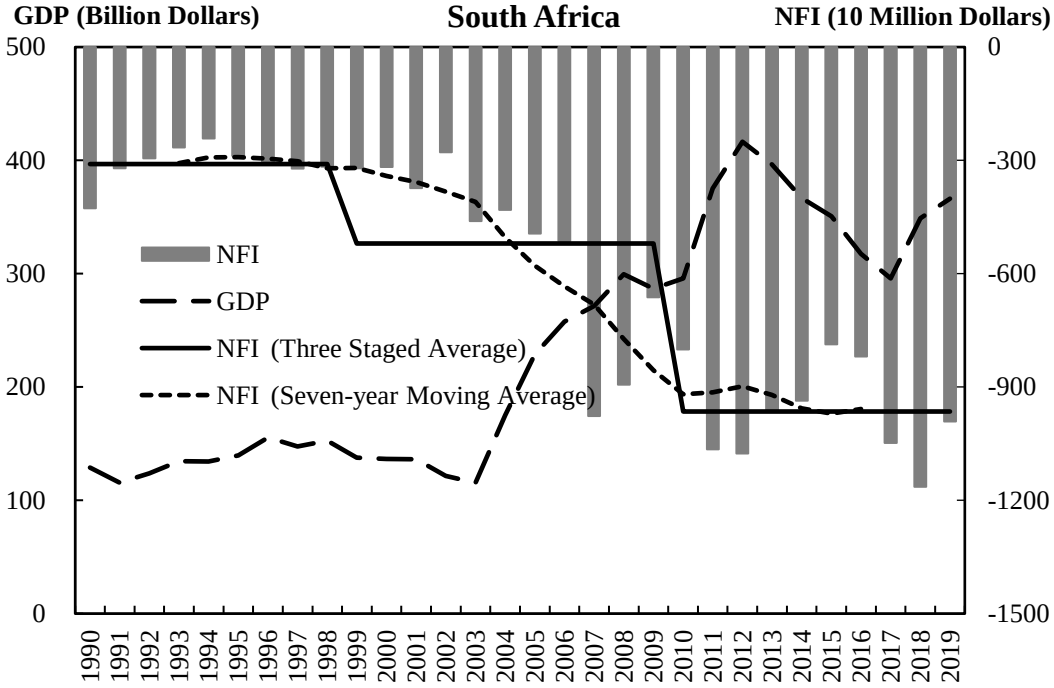

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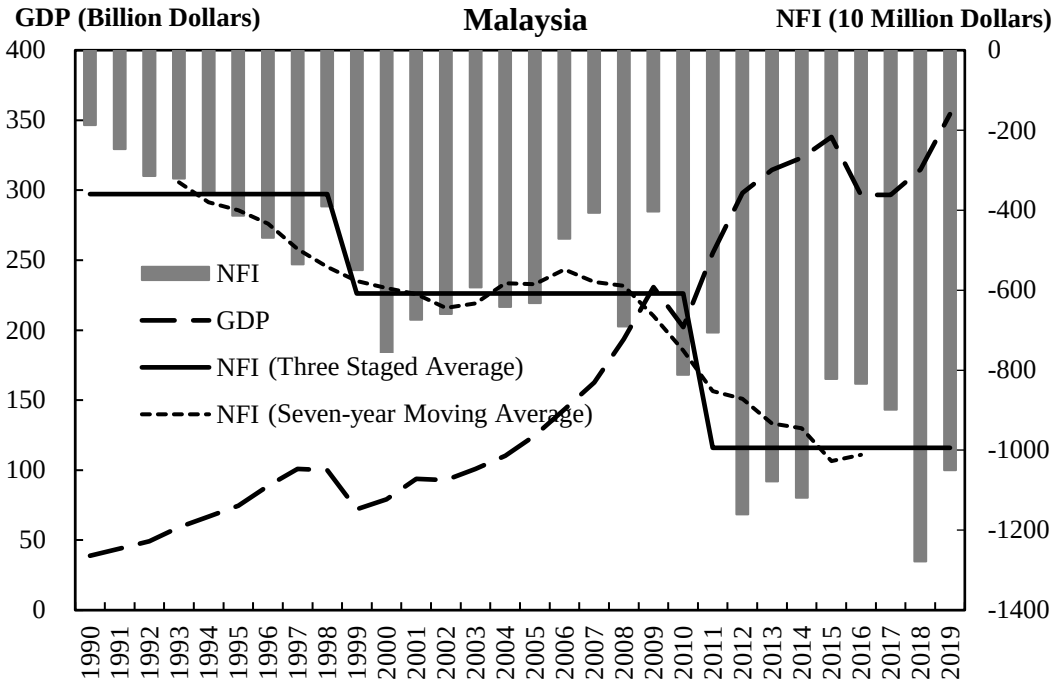

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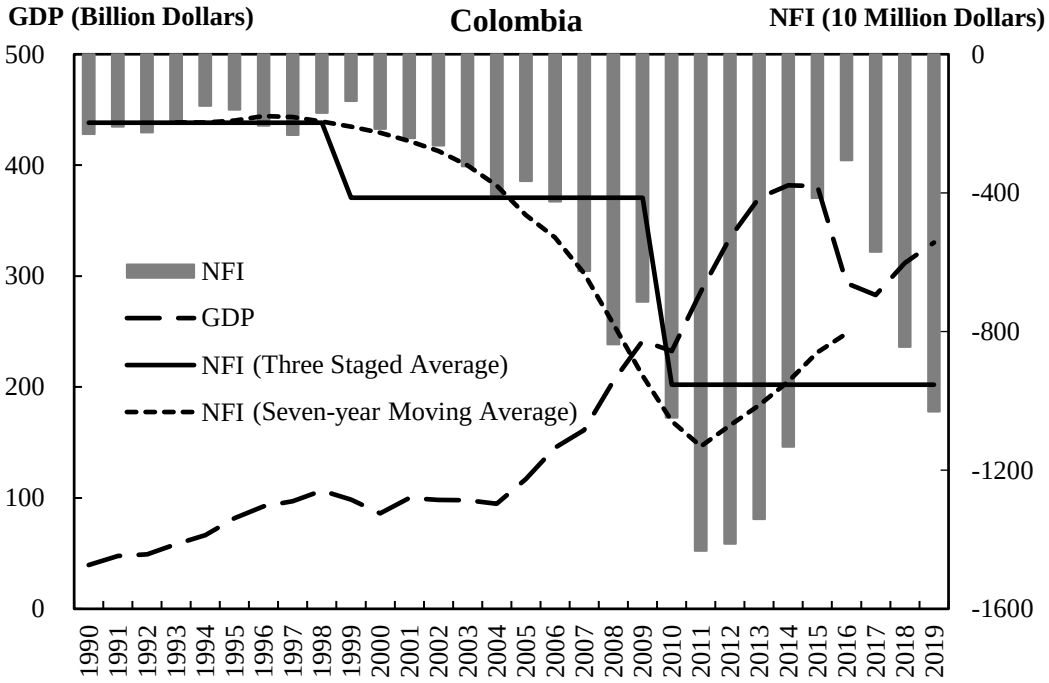

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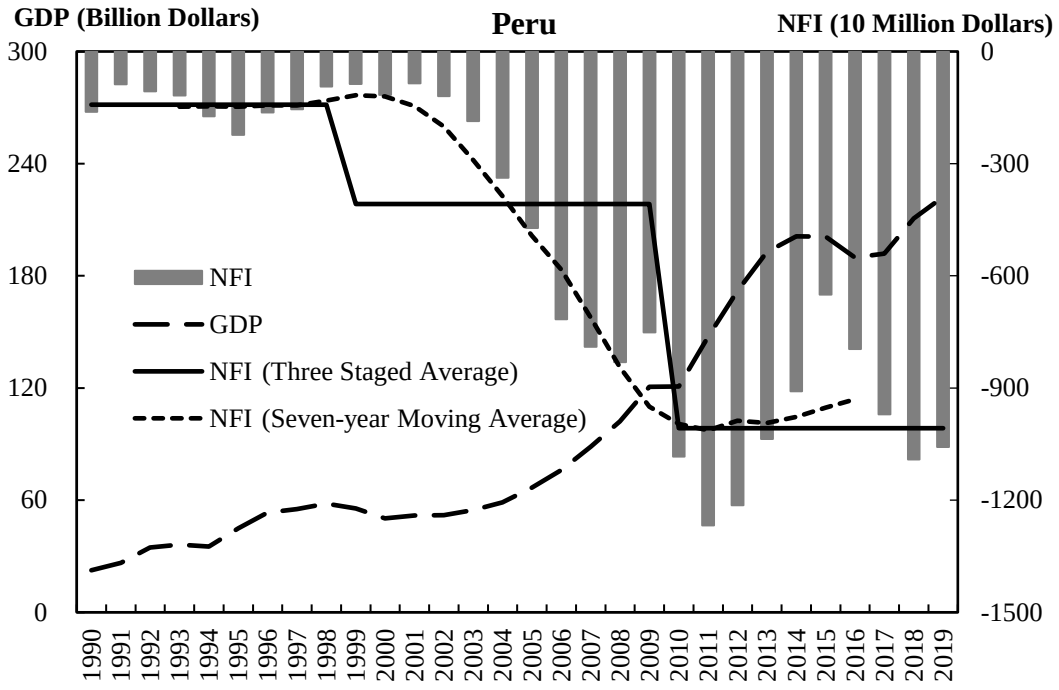

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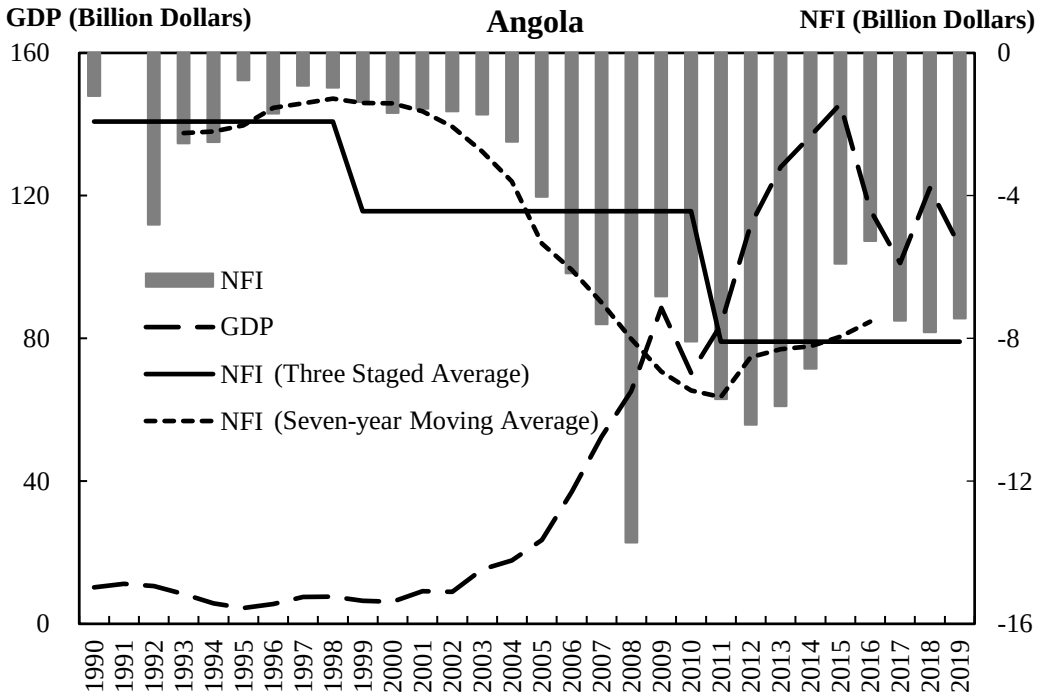

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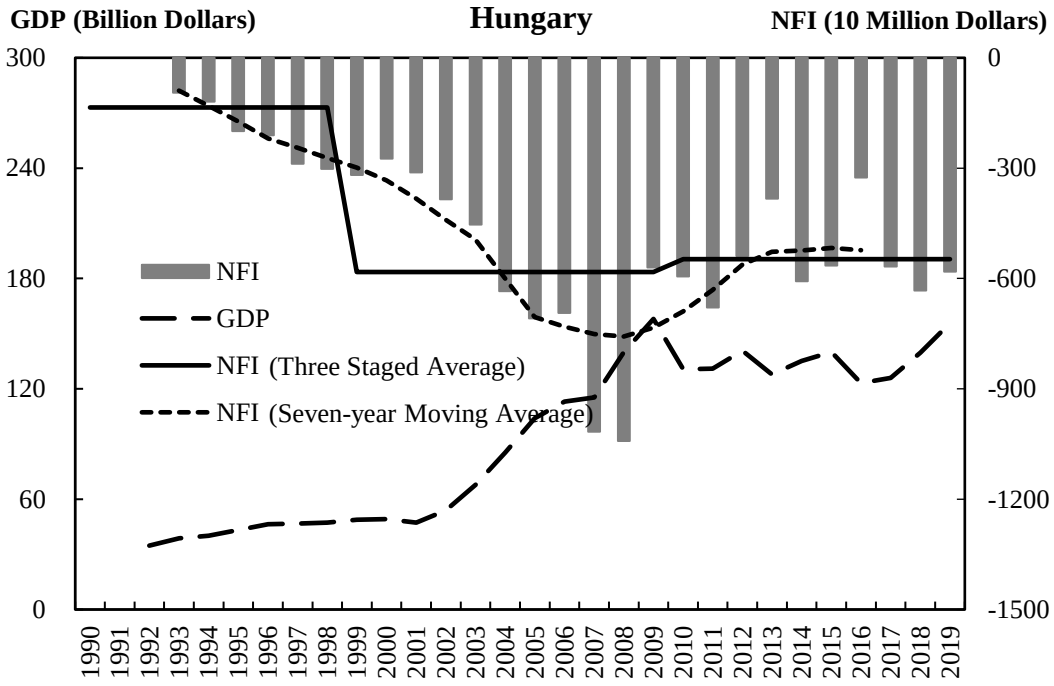

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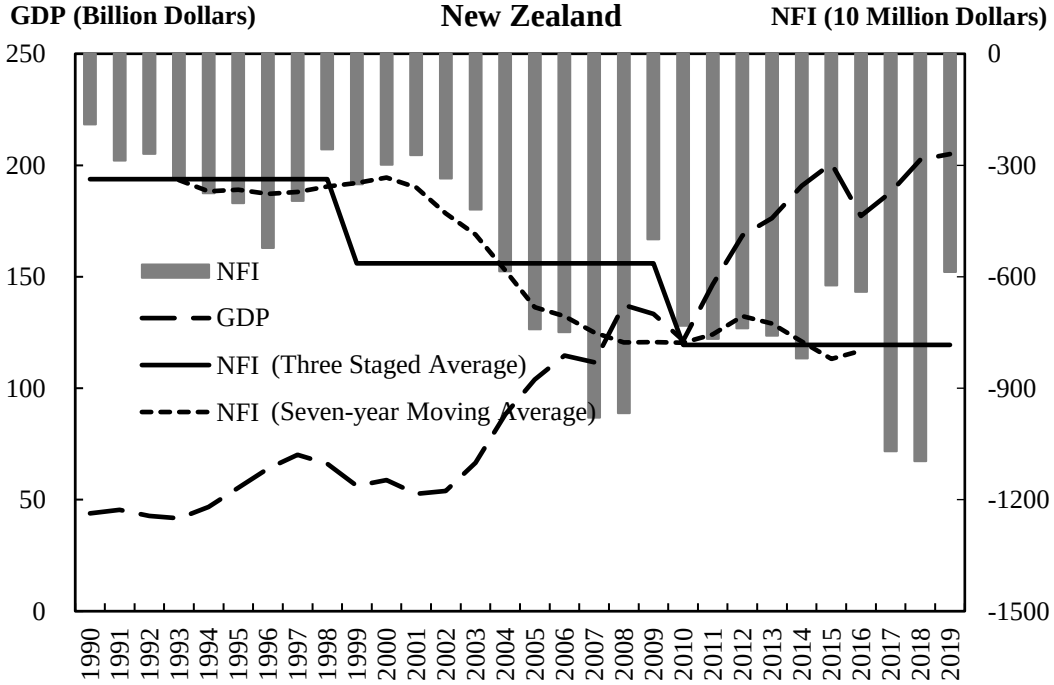

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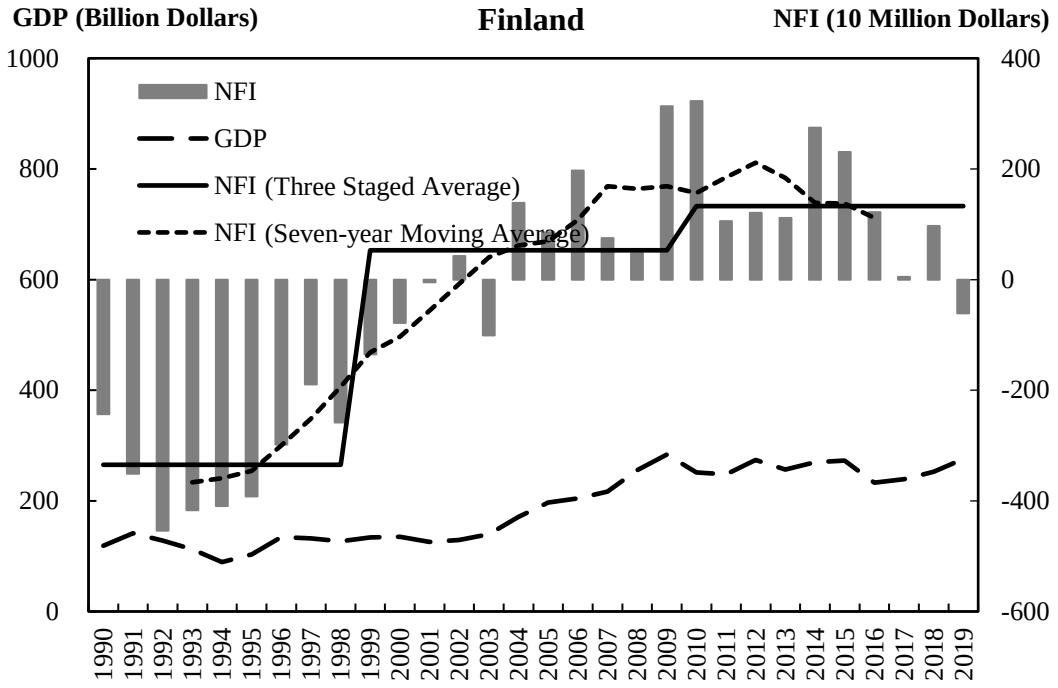

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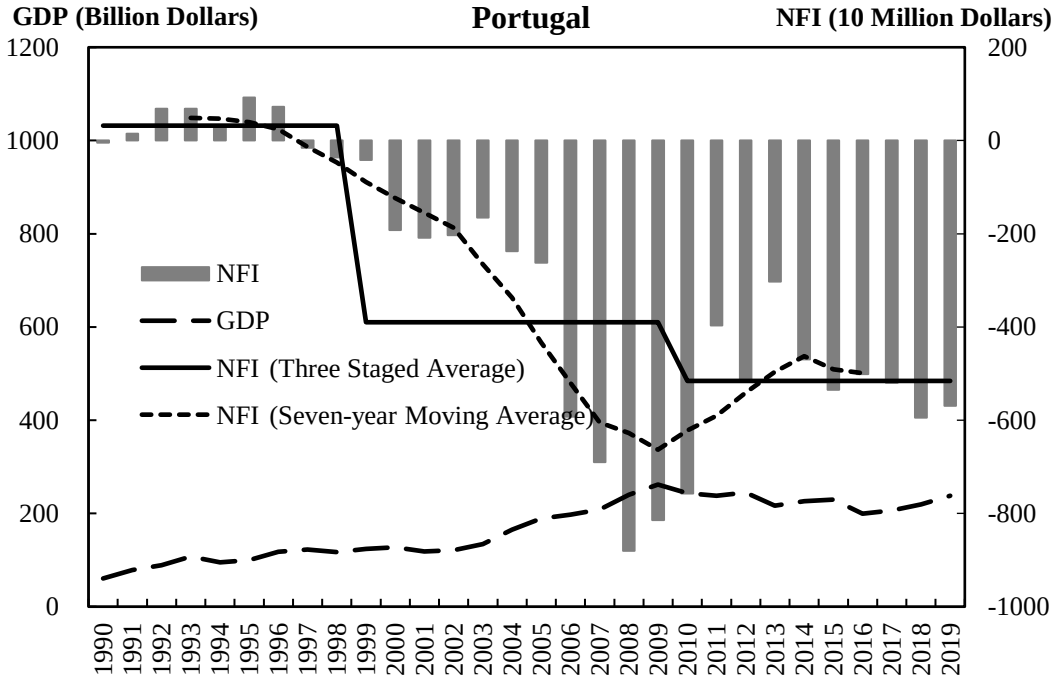

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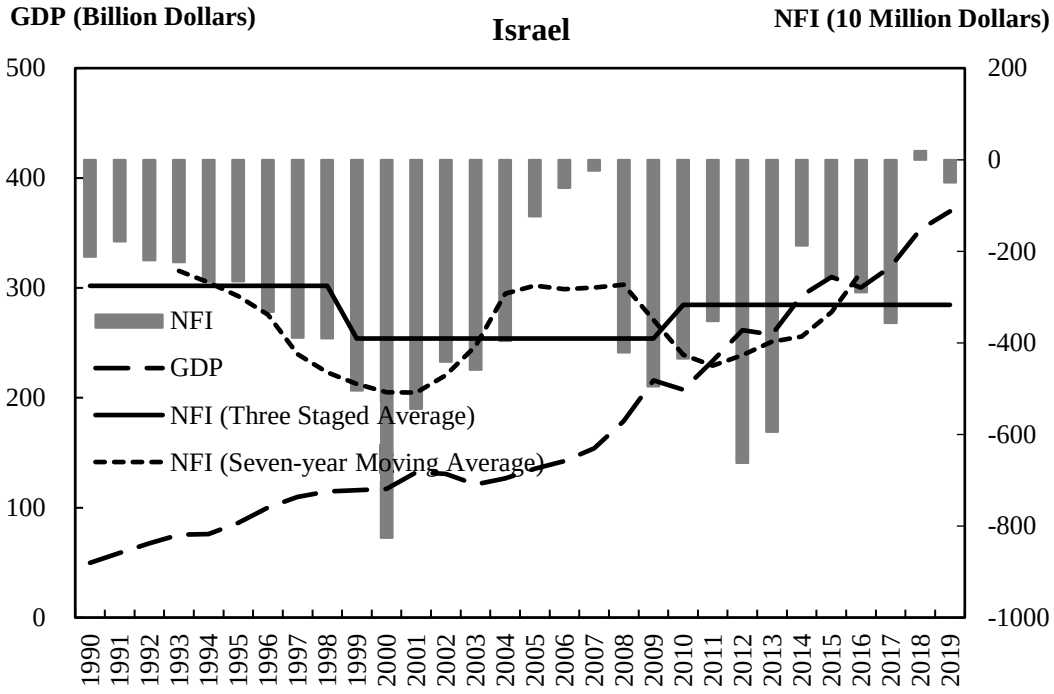

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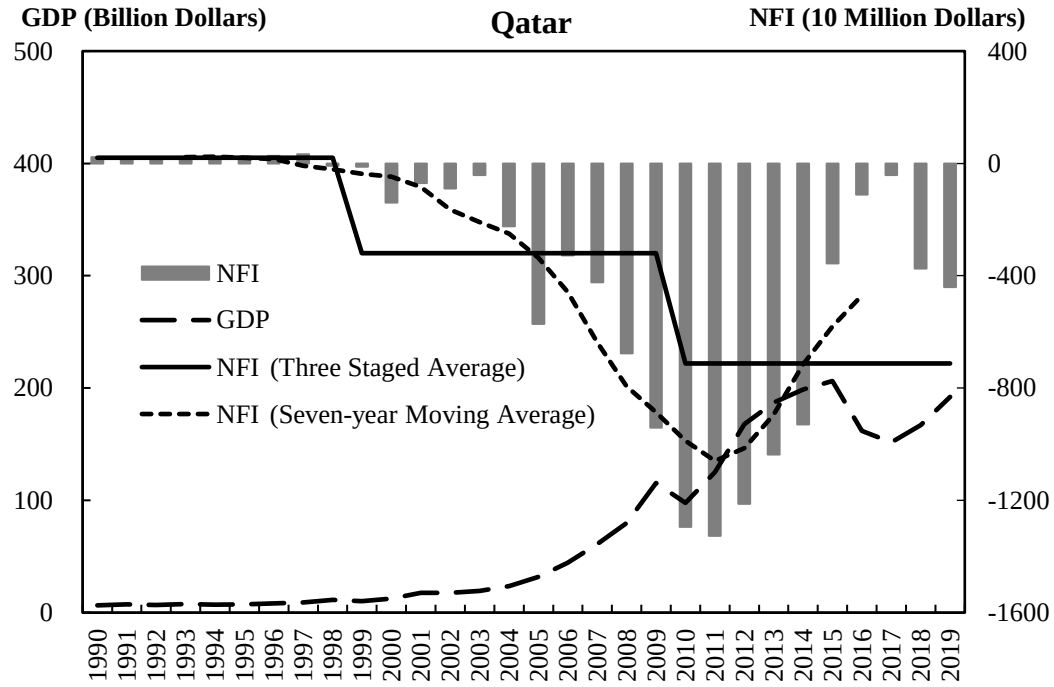

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