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Structural Transformation—How Does Thailand Compare?

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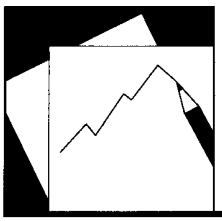

IMF Working Paper

Structural Transformation—How Does Thailand Compare?

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Asia and Pacific Department

Structural Transformation—How Does Thailand Compare?

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Abstract

Thailand stands out in international comparison as a country with a high dispersion of productivity across sectors. It has especially low labor productivity in agriculture—a sector that employs a much larger share of the population than is typical for a country at Thailand's level of income. This suggests large potential productivity gains from labor reallocation across sectors, but that process—which made a significant contribution to Thailand's growth in the past—appears to have stalled lately. This paper establishes these facts and applies a simple model to discuss possible explanations. The reasons include a gap between the skills possessed by rural workers and those required in the modern sectors; the government's price support programs for several agricultural commodities, particularly rice; and the uniform minimum wage. At the same time, agriculture plays a useful social and economic role as the employer of last resort. The paper makes a number of policy recommendations aimed at facilitating structural transformation in the Thai economy.

JEL Classification Numbers: O13, O14, O40

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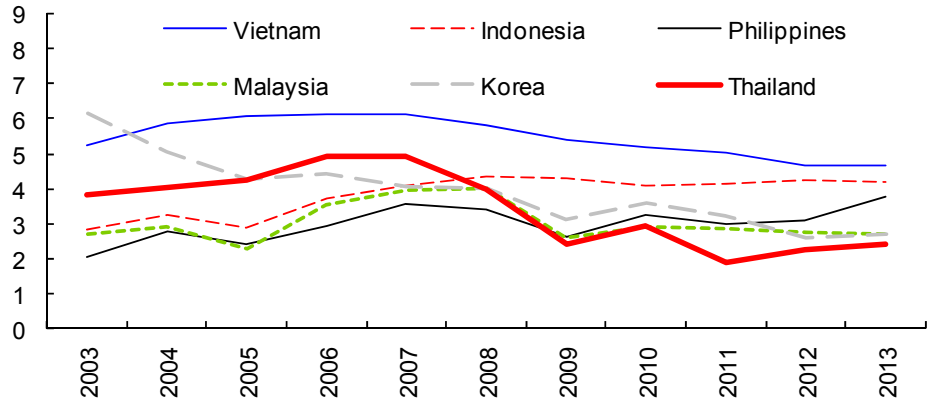
I. INTRODUCTION

Thailand's growth has decelerated dramatically over the last six – seven years. This partly reflects the impact of the global financial crisis, but the slowdown has been considerably more pronounced than in comparator economies (Figure 1).[2] Of course, Thailand's growth was brought to a halt in 2011 by devastating floods, but normally one would expect a country to rebound strongly and make up losses inflicted by a temporary supply-side disruption. That did not quite happen. Thailand's average per capita growth rate in the last five years was almost half a percentage point lower than that in Korea and Malaysia, even though Thailand could be expected to grow faster than those two higher-income economies on standard convergence grounds. Hence, even though temporary shocks have clearly affected Thailand's performance, one might suspect that structural factors have also played a role in the slowdown.

Figure 1. Real GDP per Capita Growth Rate
(5-year average; percent)



Sources: IMF, *World Economic Outlook*; and author's calculations

Among those factors, this paper focuses on the evolution of sectoral productivity and the industry composition of the Thai economy. Its premise is that economic growth is not a linear process of capital accumulation combined with exogenous technological progress but, rather, a process of structural transformation, where old activities are replaced by new ones and resources move from low-productivity to high-productivity sectors.

This notion goes back to the writings of classical development economists such as Lewis (1954), Kuznets (1966), and Kaldor (1967). In recent years there has been a surge in the literature emphasizing this aspect of development, trying to quantify it and provide cross-country comparisons. Examples of this literature include McMillan and Rodrik (2011), ADB (2013), and Dabla-Norris and others (2013). This research finds that the reallocation of labor

[2] See Isnawangsih and others (2013) for a detailed comparison of post-crisis performance in selected ASEAN economies.

from agriculture into more productive activities has made a substantial positive contribution to the growth of Asian developing economies and is one of the key factors explaining stronger growth performance in Asia than in other regions of the world.

The importance of structural transformation has been recognized by Thai researchers. Amarase and others (2013) examine firm dynamics and conclude that the Thai economy is bifurcated: "a dynamic Thailand co-exists alongside a stagnant Thailand." The use of firm-level data allows them a detailed analysis of the impact of entry, exit, and change in individual firm size and productivity on sectoral productivity, but data coverage is likely limited beyond manufacturing and some services. Chuenchoksan and Nakornthab (2008) report that intersectoral reallocation of employment contributed one- third of the 3 percent annual productivity growth in the boom years 2000−07. However, the July 2013 *Monetary Policy Report* (Bank of Thailand, 2013) notes that the contribution of labor reallocation turned negative in 2008−12. Lathapipat and Chucherd (2013) document persistent productivity differentials across sectors and a gradual reduction in the pace of structural transformation.

This paper differentiates itself from the rest of the literature in a number of ways. First, unlike the general cross-country literature, it focuses on Thailand, but unlike the Thailand-specific papers, it puts the country's performance in a comparative perspective. Second, it uses the most recent data and identifies the latest trends. Third, it ensures that the findings are robust by utilizing several datasets and a variety of analytical techniques to assess the extent of structural transformation. Finally, it uses an analytical model as an organizing framework for thinking about barriers to faster resource reallocation.

We establish the following facts: (i) the dispersion of labor productivity across sectors in Thailand is on the high side compared with that in many other economies at similar income levels; (ii) labor productivity in agriculture relative to the rest of the Thai economy is very low; (iii) agriculture's share of employment is considerably higher than what is typical for a country at Thailand's level of income; and (iv) there has been little movement toward the "norm" in the last few years. These facts suggest unexploited opportunities to raise economy-wide productivity by shifting resources from low-productivity agriculture to higher-productivity sectors (industry and modern services).

This state of affairs concerns policymakers, as indicated in recent speeches by the Bank of Thailand Governor (Trairatvorakul, 2013 and 2014), where he stated that Thailand's productivity could be increased by "matching workers to valuable production" and that policy distortions may have prevented workers from moving to higher value-added sectors. We analyze such policy distortions, including agricultural price guarantees, using a simple model. We discuss several other reasons for the observed features of the Thai economy and make policy recommendations.

The paper is organized as follows. The next section discusses our data sources. Section III presents key facts coming out of a comparison of Thailand with other economies. Section IV

checks the robustness of the results and confirms that they hold in a different dataset and with a more detailed industry breakdown than used in Section III. In Section V we switch our attention from resource allocation at a point in time to its evolution over time to see how much structural transformation has contributed to overall growth.[3] Section VI introduces a simple model that helps us analyze the impact of government policies on factor distribution across sectors. In Section VII we use the insights from the model and other considerations to shed light on possible reasons for the large cross-sector productivity differences and excessive size of low-productivity agriculture. Section VIII derives several policy implications. Section IX concludes.

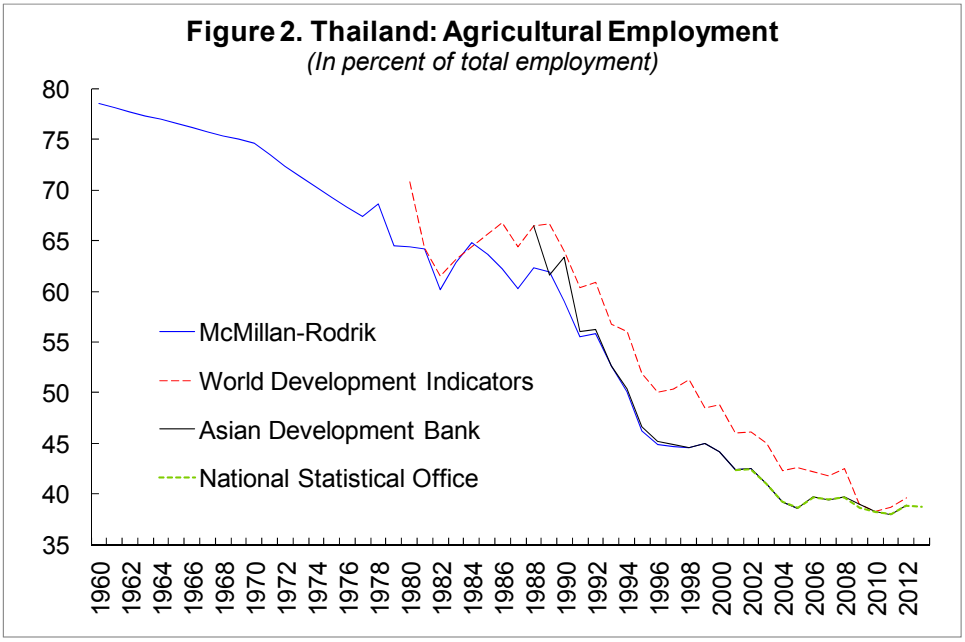
II. DATA

In order to ensure robustness of the results and bring in a cross-country perspective, we use several datasets. The main one, with the widest country coverage, comes from the World Bank's *World Development Indicators* (WDI). For most countries, the last data point in that set is 2012. The McMillan-Rodrik dataset has a more detailed sectoral breakdown, which is useful for analysis that goes beyond main aggregates, but it has more limited country coverage and ends in 2005. We also use data from Thailand's National Statistics Office (NSO) on employment and National Economic and Social Development Board (NESDB) on output. National statistics are the most up-to-date.

Cross-country datasets adjust national data to ensure international comparability, hence differences arise between various sources. As a particularly relevant example, Figure 2 shows the evolution of one of the key variables for this analysis—the share of employment in agriculture—over time in four different datasets.[4] One can see that the different series broadly tell a similar story, but the numbers do differ by a few percentage points in various years. This is not necessarily an issue, as different cross-country datasets may make different adjustments to ensure comparability, but greater consistency would be comforting. At the same time, all series report similar agricultural shares in the last few years. Moreover, all of them show a leveling of that series in the recent period, the difference being when the leveling started. Finally, as we demonstrate below, Thailand appears to be such an outlier in terms of how high the agricultural share of employment is for a country at its level of development that an adjustment of a few percentage points would not change the assessment.

[3] In this paper, the term "structural transformation" is mostly used in the narrow sense of changes in the economy's industrial structure—a shift of resources across sectors.

[4] For completeness and comparison purposes, the graph also shows the numbers from the ADB database.



One important question is whether productivity—value added per worker—should be measured in real or nominal terms. When discussing productivity *growth*, it is usually preferable to focus on changes in output and hence use constant prices. At the same time, a meaningful comparison of productivity *levels* between sectors or across countries can only be done in nominal terms. We look at both growth rates and levels; hence, we employ both constant price and current price estimates.

It would be preferable to measure productivity in terms of output per hour worked rather than per worker. However, working hours per sector are not provided in the cross-country datasets that we use. Hence, our analysis is largely limited to output per worker. It is important to recognize, however, that average hours per worker may differ across industries (as well as across countries), and we take up this issue in Section IX.

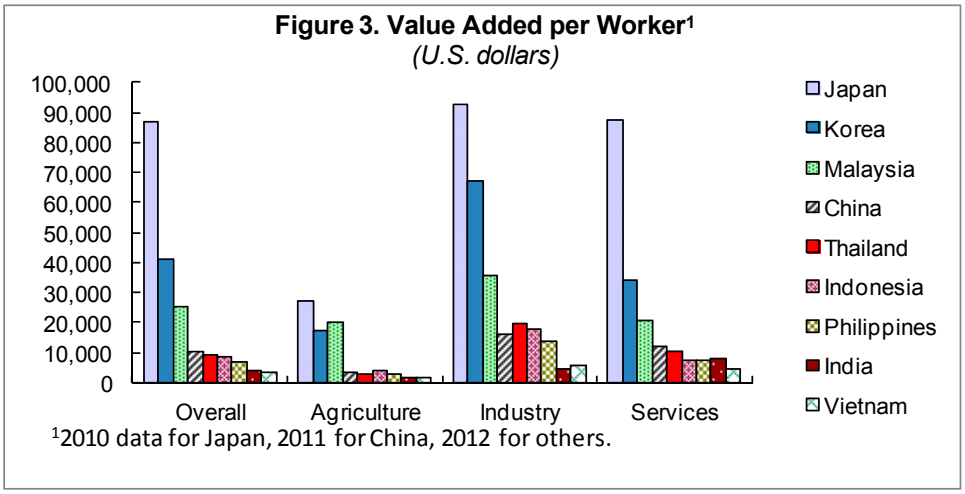
III. How Does Thailand Compare with Other Economies?

Productivity Differences

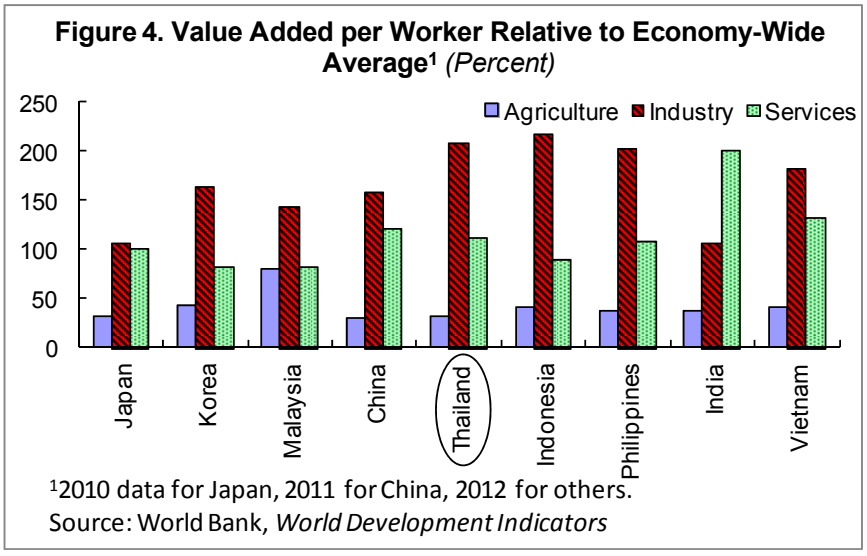
Differences in living standards across countries primarily stem from differences in labor productivity. Figure 3 demonstrates that countries that have higher overall productivity also tend to have higher productivities in individual broad sectors of the economy—agriculture, industry, and services. A comparison with selected Asian economies reveals that Thailand's productivity gap with the more advanced countries is particularly large in agriculture.[5] Value added per

[5] The comparator group includes ASEAN members closest to Thailand in their level of income (Indonesia, Malaysia, the Philippines, and Vietnam), two biggest emerging markets (China and India), and, to provide a potential model for the future, two large advanced Asian economies (Japan and Korea).

agricultural worker in Thailand is close to that in China, Indonesia and the Philippines, while industry and services workers in Thailand are noticeably more productive than in India, Indonesia, the Philippines and Vietnam.



Grouping observations by country (Figure 4), one can also notice systematic differences in value added per worker across sectors, with industrial workers the most productive and agricultural ones the least productive in every economy under consideration. An important corollary of that observation is that higher economy-wide labor productivity may be due not only to higher productivity in individual sectors but also to higher shares of workers in relatively more productive activities.[6]

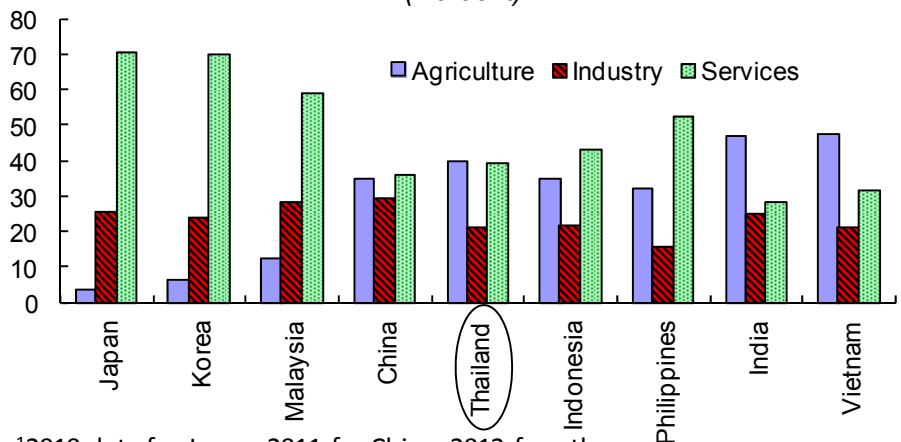


[6] Figure 4 also illustrates a fact documented by ADB (2013) that higher-income economies tend to have lower dispersion of productivity across sectors.

Employment Shares

Indeed, more advanced economies tend to have a lower fraction of their workforce employed in agriculture, which is the least productive sector (Figure 5). In that comparison, Thailand appears to have a disproportionately large share of rural employment. Based on its income level, Thailand might be expected to have the agricultural employment share somewhere between those of Malaysia and Indonesia. However, agriculture is actually the largest employer in Thailand[7] and its share exceeds that in all the countries in Figure 5 except for India and Vietnam, which have much lower income per capita.

Figure 5. Employment Shares[1]
(Percent)



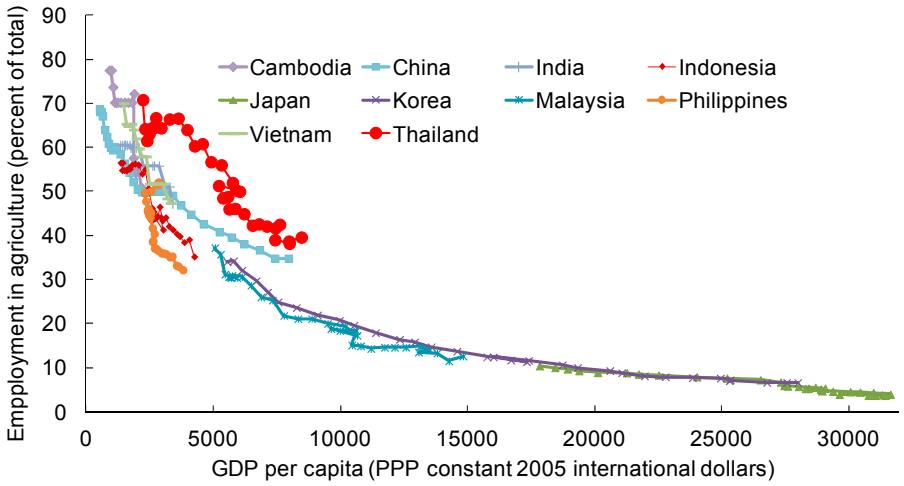
[1]2010 data for Japan, 2011 for China, 2012 for others.
Source: World Bank, *World Development Indicators.*

Systematic differences in employment shares can be observed not only across countries, but also over time. Figure 6 confirms a well-established fact that the share of agricultural employment tends to decline with the country's level of income. It actually goes beyond that—it suggests that the transition paths of many Asian economies are quite close to one another. Against this background Thailand looks like a clear outlier—its share of agricultural employment far exceeds what would be expected for its level of income.[8] The deviation is not new—Thailand has been moving broadly parallel to the typical trajectory since the late 1990s—but in the last few years the distance from that path has increased.

[7] This statement pertains to WDI data for 2012. Thai national statistics show services employing slightly more people than agriculture since 2008.

[8] Another outlier is China, where the high agricultural share could likely be ascribed to the registration system (*hukou*), which inhibits the movement of people from rural to urban areas and might also result in statistical biases.

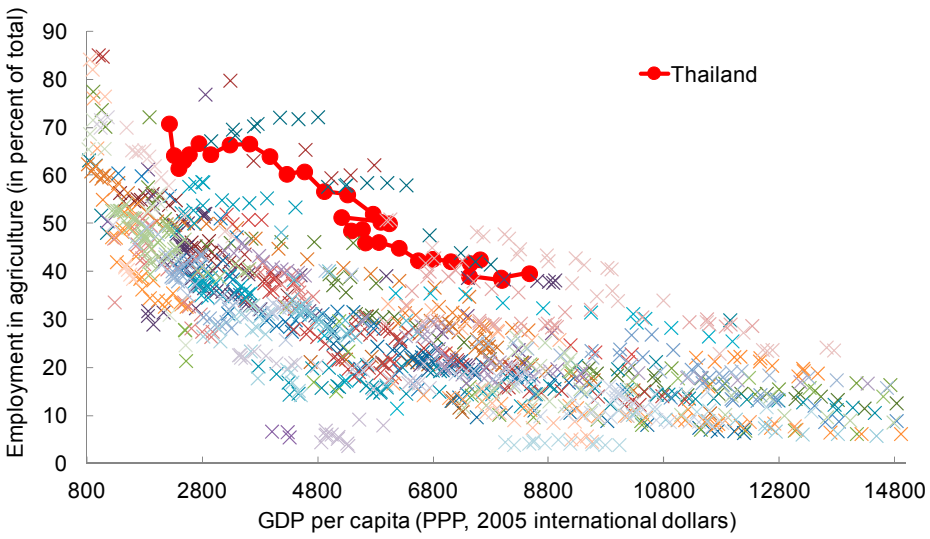
Figure 6. Employment in Agriculture and GDP per Capita in Selected Asian Economies



Source: World Bank, *World Development Indicators*.

Figure 7 looks at the whole universe of middle-income countries in the *World Development Indicators* database. While for this group there does not appear to be a common path similar to that found in the more homogeneous set of Asian economies, Thailand looks like one of the extreme cases in this broad comparison as well.

Figure 7. Employment in Agriculture and GDP per Capita in Emerging Market and Developing Economies



Source: World Bank, *World Development Indicators*.

Putting It All Together

Coming back to cross-sectoral productivity differentials depicted in Figure 4, one way to summarize the dispersion in a single number would be to calculate a weighted coefficient of variation according to the following formula:

$$WCV = \sqrt{\sum_{i=1}^{3} S_i \left(P_i - P\right)^2} \Big/ P,$$

where P_i stands for labor productivity in sector i, P for economy-wide productivity, and S_i for the labor share in sector i. By that measure, Thailand has the second largest dispersion of labor productivity across sectors among the nine featured economies (see Table 1).

Table 1. Weighted Coefficient of Variation

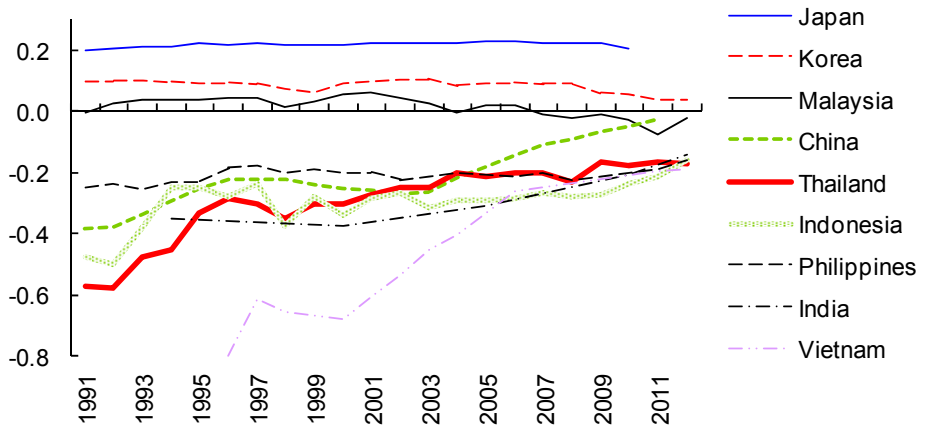
Japan	Korea	Malaysia	Thailand	Indonesia	Philippines	China	India	Vietnam
0.14	0.37	0.28	0.66	0.65	0.54	0.54	0.69	0.58

Of course, the weighted coefficient of variation may be elevated because of high employment in a sector with relatively strong, rather than weak, labor productivity, which would not be a problem. To distinguish those cases, we introduce a measure (following Ahn, 2015) that captures the covariance of labor shares and sectoral productivity. The covariance will be positive if sectors employing a large fraction of workers happen to have relatively high productivity and negative in the opposite case. As such, it conveys information about the efficiency with which the economy employs available resources. As the equation below shows, covariance can be calculated simply as the difference between economy-wide productivity P (which is a weighted average of sectoral numbers) and a simple productivity average across sectors $\bar{P}$.

$$COV = \sum_{i=1}^{n}\left(S_t^i - \bar{S}_t\right)\left(P_t^i - \bar{P}_t\right) = \sum_{i=1}^{n} S_t^i \left(P_t^i - \bar{P}_t\right) - \frac{1}{n}\sum_{i=1}^{n}\left(P_t^i - \bar{P}_t\right) = \sum_{i=1}^{n} S_t^i P_t^i - \sum_{i=1}^{n} S_t^i \bar{P}_t + \left(\bar{P}_t - \bar{P}_t\right) = P_t - \bar{P}_t$$

To make this measure comparable across countries and over time, we scale it by economy-wide productivity. As Figure 8 demonstrates, Thailand showed a fast improvement in the efficiency of labor allocation in the period before the Asian financial crisis, a slower pace in the subsequent decade, and little change in the last five years. By this metric, Thailand's efficiency is on par with that of India, Indonesia, the Philippines and Vietnam and considerably below what is observed in China, Japan, Korea, and Malaysia.

Figure 8. Scaled Covariance



Sources: World Bank, *World Development Indicators*; and author's calculations

To summarize, the data reveal the following facts: (i) the dispersion of labor productivity across sectors in Thailand is high compared with that in many other Asian economies; (ii) labor productivity in agriculture relative to the rest of the Thai economy is very low; (iii) agriculture's share of employment is considerably higher than what is usual for a country at Thailand's level of income; and (iv) there has been little movement toward more typical values of these characteristics in the last few years. This implies that Thailand's average productivity and, hence, standard of living could be improved significantly if it were possible for a considerable portion of its agricultural workers to find employment in industry and services at productivity levels prevalent in those sectors. As an illustration, reducing the agricultural share to 22 percent—the value consistent with Thailand's level of income—by shifting some of the farm workers into industry and services (in proportion to the relative size of those two sectors) while maintaining Thailand's productivity in each individual sector would raise Thailand's economy-wide productivity by 20 percent.

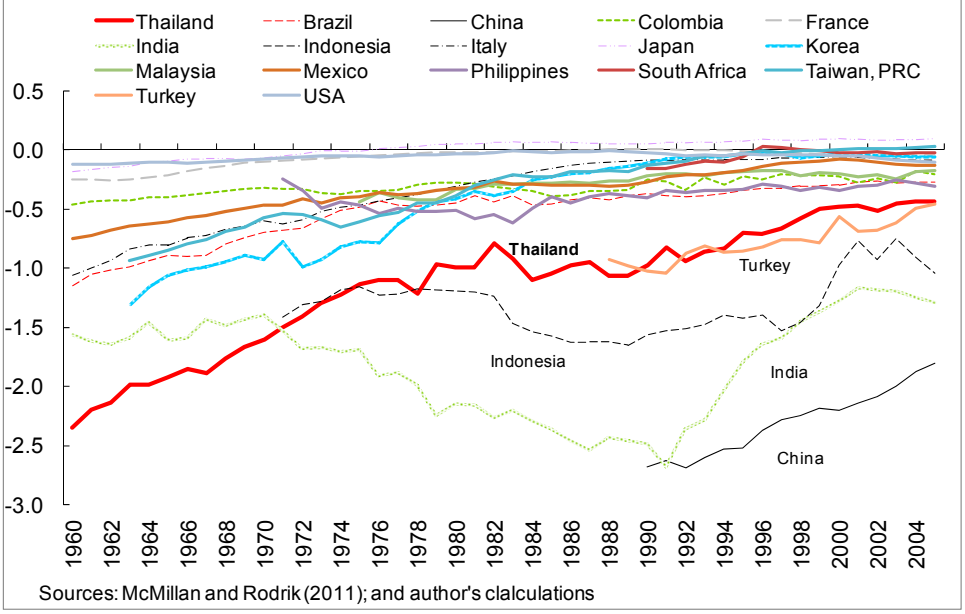
IV. More Detailed Breakdown

So far we have kept the sectoral breakdown at a very broad level and focused on the juxtaposition of high-employment, low-productivity agriculture and low-employment, high-productivity industry. In this section we use the McMillan-Rodrik (2011) dataset to compare Thailand's industrial structure against other countries at a more disaggregate level. The original dataset contains information on nine sectors: (1) agriculture, forestry, hunting and fishing; (2) mining and quarrying; (3) manufacturing; (4) public utilities; (5) construction; (6) wholesale and retail trade plus hotels and restaurants; (7) transportation, storage, and communication; (8) finance, insurance, real estate and business services; and (9) community, social, personal, and government services. We take out the mining and quarrying sector, as well as public utilities, because these sectors typically are small in terms of employment but are highly capital intensive. Depending on commodity prices, value added per worker may be extremely high in

those sectors, thus skewing the simple average, but potential for reallocating additional workers there might be very limited. Thus, we reduce the number of sectors to seven.

The McMillan-Rodrik dataset contains sectoral labor shares as well as value added per worker measured in local currency, in U.S. dollars, at constant prices, and in constant PPP dollars. We use the last measure, which the authors believe to be the most comparable across countries, to calculate scaled covariance applying the method described in Section IV. Figure 9 shows the evolution of covariance over time for selected countries in the dataset.

Figure 9. Scaled Covariance for Selected Countries



Sources: McMillan and Rodrik (2011); and author's clalculations

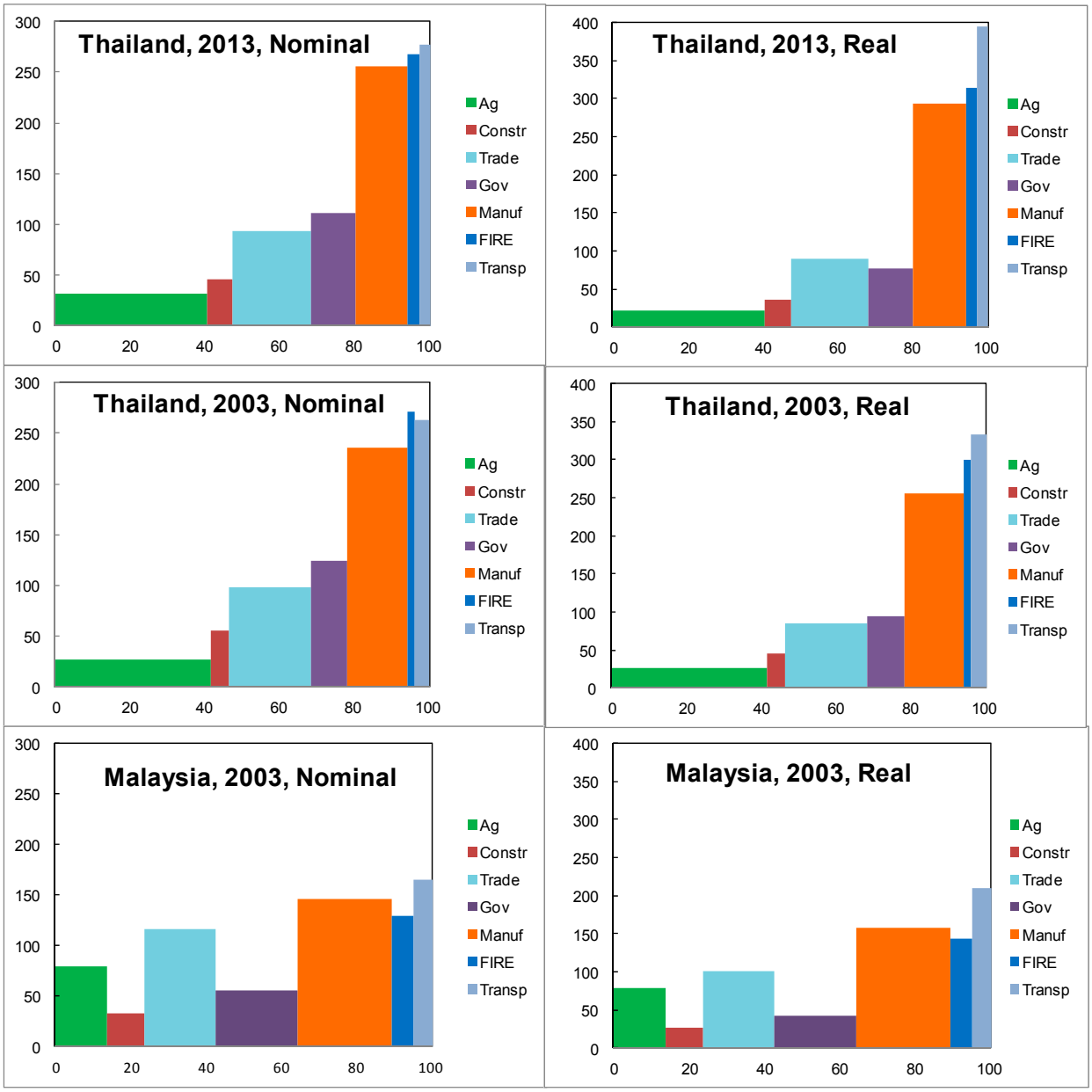
On that measure, there is a noticeable gap between Thailand and the bulk of advanced and emerging market economies, even though Thailand looks more efficient than a few lower-income economies. Moreover, the pace of efficiency gains clearly slowed after the Asian financial crisis.

We also use the seven-sector breakdown for a visual representation of sectoral labor shares and productivity differences (Figure 10). In that figure, the width of each bar represents the share of employment in that sector while its height equals labor productivity in that sector relative to the economy-wide average.[9] To trace the evolution over time we show the graph for Thailand in 2013 (the most recent year) and ten years before. We also show what the picture looked like for Malaysia in 2003, when its GDP per capita in constant PPP dollars was relatively close to

[9] The McMillan-Rodrik dataset ends in 2005. For the observations after 2000 the numbers for Thailand are compatible with national data, and we use the latter to extend the dataset for Thailand through 2013. We can only do it at current and constant prices in local currency terms, but not in PPP-adjusted U.S. dollars.

what it is in Thailand now. The underlying numbers for the value added are at current prices on the left-hand side of the panel and at constant prices on the right-hand side.

Figure 10. Value Added per Worker (Percent of Economy-Wide Average)



Note: Ag=agriculture, forestry, hunting and fishing; Constr=construction; Trade=wholesale&retail trade and hotels&restaurants; Manuf=manufacturing; FIRE=finance, insurance, real estate and business services; Transp=transportation, storage, and communication.

Sources: McMillan and Rodrik (2011); Thailand's National Statistical Office; and author's calculations.

Three facts stand out in these pictures. First, the dispersion of sectoral productivity is quite wide in Thailand—much wider than in neighboring Malaysia. Second, as already noted, a very large

proportion of the population is engaged in the lowest productivitysector—agriculture. And third, Thailand's distribution is fairly stagnant. The agriculture share did not change between 2003 and 2013. The second-lowest-productivity sector—construction—actually expanded a little, while the high-productivity manufacturing shrank. The financial sector increased noticeably relative to its original size but marginally as a fraction of total employment, while the transportation and communication sector got a bit smaller. In terms of relative value added per worker, not much changed either. Agriculture improved its standing somewhat in nominal terms, but this reflects an increase in the prices of agricultural commodities rather than productivity gains. In real terms, the distribution got wider, with relative productivity rising in the high-performing sectors (manufacturing, finance, and transportation and communication) and dropping in the lagging ones (agriculture and construction).

This decomposition also highlights the large differences in productivity not only across the three broad sectors (agriculture, industry, and services), but also among their subsectors. Within industry one can contrast low-productivity construction with high-productivity manufacturing. In services, there is a very large difference between trade and hospitality services, on the one hand, and financial services, as well as transportation and communication, on the other. Of course, there are good reasons for differences in productivity among these narrower sectors, but the comparison with Malaysia suggests that these differences might be excessive in Thailand's case.

V. DYNAMICS

While large productivity differences between sectors suggest static inefficiency in resource allocation, they also imply potential gains from realignment. Above we have provided a few snapshots and looked at the evolution of the covariance measure over time, both suggesting that Thailand has been slow to realize such gains over the last decade or so. In this section, we examine more explicitly changes in sectoral productivity and employment shares to see how much structural transformation has contributed to the growth of the Thai economy.

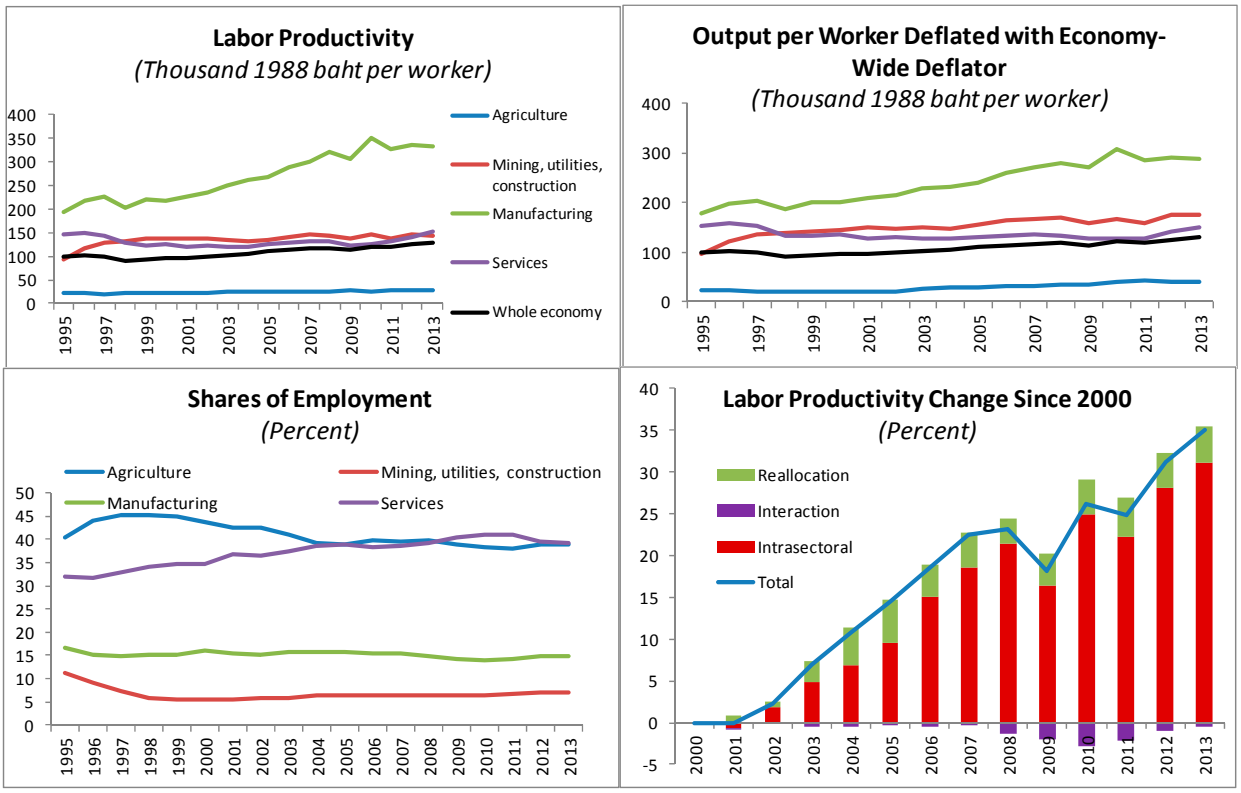
In the panel below (Figure 11) we trace the evolution of employment shares and productivity in four major sectors in Thailand.[10] To separate productivity growth from price changes, we focus on value added per worker at constant prices (top left panel).[11] We can see that manufacturing has been the key driver of economic growth, while the trends look fairly flat in the other sectors. Between 2000 and 2013, productivity grew more than twice as fast in manufacturing as it did in

[10] In view of the differences noted in Section IV, we split industry into two parts—manufacturing and the rest, which includes mining, construction, and utilities. We use the latest data from national statistics.

[11] Retaining the information on relative prices while taking out the broad price trend, as done in the top right panel, indicates that an increase in agricultural prices after 2000 helped raise nominal value added per worker in agriculture relative to the rest of the economy even though agricultural productivity grew slower than economy-wide productivity.

agriculture or services and almost ten times as fast as in other industry. And it was already by far the highest to begin with. Nevertheless, that sector has drawn little additional employment—its share has been roughly flat over the last 15 years (bottom left panel). More broadly, after some shift of labor from agriculture to services, employment shares have been quite stable since 2005. Hence, Thailand's overall productivity growth in recent years has clearly been driven by productivity growth in individual sectors (primarily manufacturing), with little if any contribution coming from structural transformation.

Figure 11. Evolution of Employment Shares and Productivity in Thailand



Sources: NSO; NESDB; and author's calculations.

We confirm this impressionistic conclusion with quantitative analysis. The bottom right panel presents a decomposition of cumulative labor productivity growth into three components—intrasectoral productivity growth; intersectoral labor reallocation; and dynamic interaction between the two (see Appendix I for details).[12] We can see that the bulk of the productivity

[12] We focus on employment and labor productivity, where data are reliable and the assessment of what is good and bad from the point of view of economic efficiency is fairly straightforward. But, of course, capital is another key input into production. In Thailand, the capital-labor ratio in agriculture is much lower than in industry and services, but it has been increasing at a faster pace since 2000, and overall capital in agriculture has been growing somewhat faster than in industry and much faster than in services. This has helped increase agricultural productivity. On the other hand, it appears that TFP growth in agriculture has been much lower than in the other sectors, although measuring TFP accurately is a challenge.

increase since 2000—and pretty much all of the increase since the mid-2000s—has come from intrasectoral growth, and indeed very little can be attributed to structural transformation.[13,14]

VI. MODEL

We use a simple model to illustrate possible reasons for the high share of labor in agriculture and large productivity differences between sectors and to point out their consequences. In that model the economy is endowed with a fixed amount of uniform labor. Workers can be employed in one of two sectors—agriculture (A) or manufacturing (M). They can move freely across sectors, and thus in equilibrium the wage rate should be the same in both sectors. Manufacturing and agriculture consist of a large number of competing firms (or farms). They produce internationally traded goods and, in the absence of trade restrictions, the domestic prices of agricultural and manufacturing products will equal the international prices (adjusted for the exchange rate). If the product and labor markets are competitive (so the firms take the product prices and the wage rate as given), the equilibrium wage rate will equal the value marginal product of labor (VMPL, or the physical marginal product of labor (MPL) times the price P) in each sector.[15] Hence, in the competitive market equilibrium, VMPLs will be equalized across sectors.

It is easy to see that such an allocation will also be optimal from the point of view of the social planner. Regardless of what consumer preferences are, if all goods in the economy are tradable, it is optimal for the economy to maximize the value of its product at international prices as it would give it access to the widest possible consumption set. The value will be maximized when the value marginal products at international prices are the same in both sectors, otherwise the value could be increased by moving a worker from one sector into the other.

Figure 12 provides a graphic exposition of the model. In the figure, the width of the frame represents the labor endowment. The number of workers employed in agriculture is measured from left to right, and the solid black downward sloping line shows the declining value marginal product in agriculture in the absence of tariffs or any other price interventions. The number of manufacturing workers is measured from right to left, and the declining VMPL in manufacturing is represented by the upward sloping solid black line.

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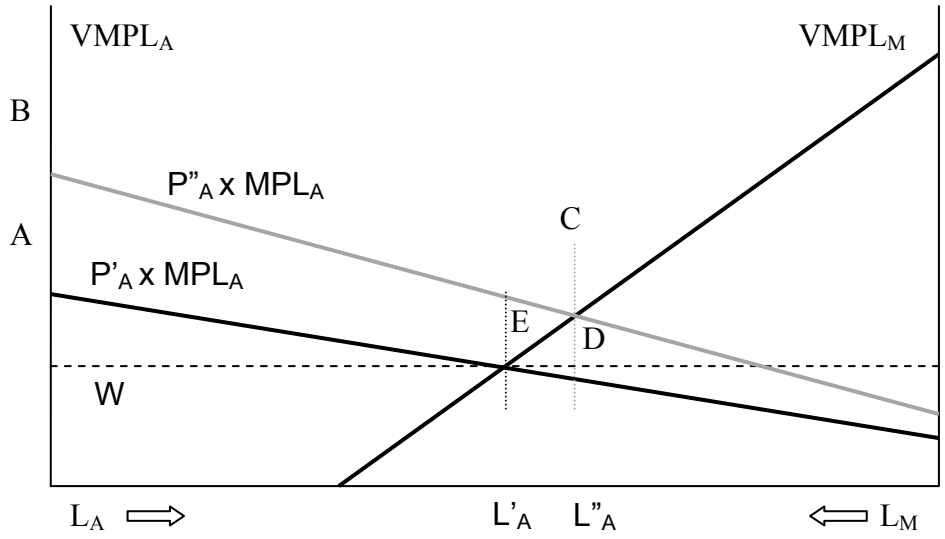
[13] The interaction term turned negative in 2008−12 mainly because following the global financial crisis, the share of employment in manufacturing fell below its value in the base year (2000) while manufacturing productivity remained considerably higher than in 2000.

[14] A similar decomposition using WDI data indicates that labor reallocation provided a much larger contribution to overall productivity growth in Thailand in the 1990s, despite the setback dealt by the Asian financial crisis, than after 2000.

[15] Each individual firm maximizes its profit $PQ(L)$-WL. If P and W do not depend on L, the first order condition is $PQ'(L)=W$. We assume that for standard reasons the MPL declines as more labor is allocated to a sector, so the solution to the first order condition yields the unique maximum.

In equilibrium, agricultural and manufacturing employment adds up to the total labor endowment, and the VMPLs are the same in both sectors (since both have to equal the same wage rate). On the graph, that equilibrium allocation is given by the intersection of the two black VMPL curves, with L'_A being optimal agricultural employment given the world prices, domestic technology, and resource endowments.

Figure 12. Impact of Guaranteed Price

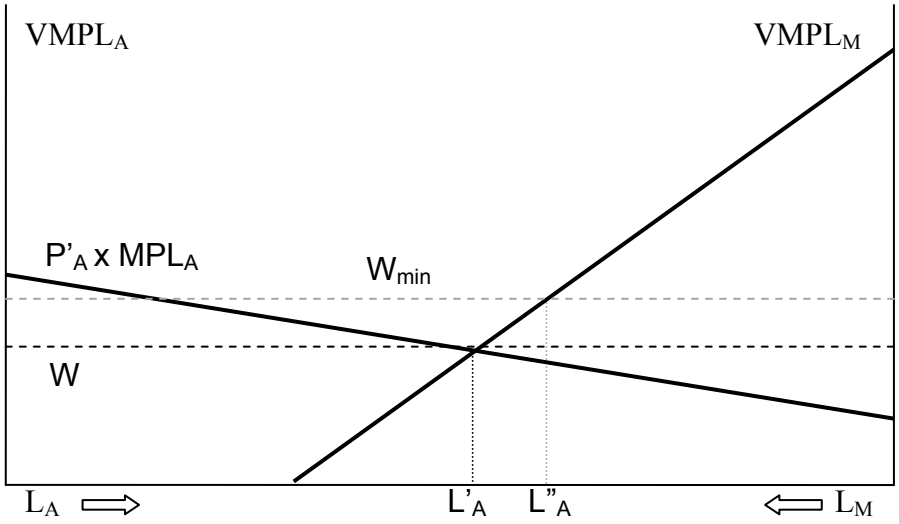


With the help of this model we can analyze the impact of government intervention in the functioning of the market. If the government sets the price of the agricultural commodity P''_A above the world price P'_A (and guarantees that it will purchase an unlimited amount at this price), it will shift the VMPL$_A$ curve up as shown by the solid grey line. In the new equilibrium, agricultural employment will be higher (L''_A.rather than L'_A), while the marginal and average labor productivity will be lower in the agricultural sector and higher in manufacturing than without intervention. Such policy results in a welfare loss, as the value of the economy's total product at world prices (which is the right benchmark for an open economy) is reduced by the difference in the productivity of workers shifted from higher value-added manufacturing to lower value-added agriculture. In the graph, that loss is given by the area of the triangle CDE. It is also important to note that the cost of this policy to the taxpayer is represented by the large trapezoid ABCD. This analysis highlights the budgetary and the welfare costs of price support policies.[16]

[16] Of course, the VMPL schedules may shift if international commodity prices change. For example, an increase in food prices would push the VMPL$_A$ curve up, increasing the equilibrium share of labor in agriculture. Unlike the policy-induced shift, such a change would be optimal as it would reflect a true increase in the value added per farm worker.

Another government intervention is the minimum wage. Typically, the minimum wage is not enforced beyond the formal sector. Given the large extent of informality in agriculture, it is not unreasonable to assume for modeling purposes that the minimum wage applies only to manufacturing. If the minimum wage is set above the market-clearing wage, employment in the manufacturing sector will be limited as the firms will not find it in their interest to hire workers whose marginal productivity is below the minimum wage, even if it may be higher than in their alternative employment in agriculture. Thus, as shown in Figure 13, the manufacturing sector will be too small (and, hence, the agricultural sector too big) compared to the optimal resource allocation.

Figure 13. Impact of Minimum Wage



The model focuses on a static allocation of resources, but one can use it to touch upon an essential dynamic issue as well. Suppose that, as is argued by Matsuyama (1992), manufacturing is an important engine of growth and there are large learning-by-doing externalities in that sector. In other words, sector-wide productivity growth depends on total manufacturing output. In that case, reducing the scale of manufacturing operations lowers not only the level of average productivity in the economy at a point in time, but also its growth rate by constraining the growth rate of manufacturing productivity.

The model highlights an important issue. Optimality requires that the *marginal* value products of labor be equalized, while the analysis above mostly focuses on *average* productivity. It might be possible that diminishing returns set in much faster in manufacturing than in agriculture, so that (as shown in the graph) the former sector has a much steeper VMPL curve. In that case, the difference in average productivity would not necessarily imply a marginal productivity differential, and gains from reallocating workers from agriculture to manufacturing might be small or nonexistent. This issue would require an investigation into technology that is beyond

the scope of this paper, but a priori it is not obvious why the wedge between average and marginal productivity would be much higher in the manufacturing sector than in agriculture.[17]

One clearly unrealistic feature of the model is that it assumes that all workers have identical skill sets and could easily move between occupations. Obviously, a newcomer to a city just starting in a factory job is unlikely to be as productive as a seasoned worker. However, the model is used to look into the issue of structural transformation over time rather than, say, a response to short-term sector-specific shocks, for which the assumption of uniform labor would be clearly inappropriate. Given the huge productivity differentials in Thailand, there must be incentives both for rural dwellers to develop skills suitable for factory jobs and for the firms to help them do so. The impact would not be immediate, but it should be seen over time, and it remains a puzzle why the process is so slow. In addition, even if workers are not perfectly substitutable across sectors, but there is some degree of substitutability, the conclusion of the simple model above would still be valid. Namely, guaranteeing a purchasing price of the agricultural good that is above the market price or setting the minimum wage in the formal sector above the equilibrium wage will produce a suboptimally large agricultural sector and small manufacturing sector.

A related assumption is that the workers care only about their wage rate and are willing to move to a sector with the highest wage. This tendency leads to wage equalization across sectors. If a sufficient number of workers have a higher intrinsic value (or lower disutility) from working in one sector than in the other, they will be willing to accept a lower wage in their preferred sector. This will lead to a larger size and lower productivity in that sector. At the same time, just as in the case of limited worker substitutability, price and wage interventions will still have the same impact as in the model.

A two-sector model is an obvious simplification, but if all the goods are tradable internationally, the number of sectors does not matter. It is still optimal for the country to maximize the value of its product measured at world prices, and the key condition for that is the equalization of value marginal products of labor across sectors. Thus, the key results would go through in a multiproduct world. The presence of a nontradable sector would complicate the exposition since optimal resource allocation would depend not only on technology but also on consumer preferences. Still, it appears quite clear that the main messages from the model—that large differences in value marginal products imply inefficiency, and that price or wage supports may affect resource allocation and create those differences—remain valid.

VII. WHAT EXPLAINS THAILAND'S IDIOSYNCRASIES?

The previous sections have amply documented the fact that Thailand has an overly large share of its population employed in agriculture, even though labor productivity in that sector is

[17] McMillan and Rodrik (2011) make the same point.

considerably lower than in the rest of the economy. A frequent reaction from a person with a passing familiarity with Thailand when presented with the fact that around 40 percent of the country's labor force is employed in agriculture is to suggest that Thailand is particularly well suited to be the world's food basket because of its nature, geography, and tradition. From the point of view of economics, this argument, which has a superficial appeal, boils down to a statement that Thailand has a comparative advantage in agriculture. However, as the evidence above demonstrates, such a statement would be incorrect. Thailand's productivity in agriculture is far lower than in the other sectors, and the gap is much larger than in most other countries. This is the exact opposite of comparative advantage. It may sound contrary to received wisdom, but Thailand is rather inefficient in producing agricultural commodities and should not specialize in them to the extent it does.

Why then does agriculture draw so many workers? One reason is that it plays the role of residual employer. When people lose their jobs in other sectors, many of them move to the farms rather than staying unemployed. Similarly, reportedly a fair number of retirees take up farming. Thus, the alternative to farming might often be no job at all rather than a city job, and involvement of such people in agriculture raises Thailand's GDP even if it lowers average productivity.[18]

There is also a question of whether those who grew up in rural areas are ready to take up city jobs. The Labor Force Survey shows that agricultural workers have lower educational attainment than those in manufacturing. Moreover, the quality of instruction tends to be lower in rural areas, resulting in less knowledge and skill for the same level of schooling. Thus, one of the reasons for the high percentage of Thailand's population being confined to low-productivity agriculture is their low education and skill level.[19]

At the same time it should be noted that rural areas tend to lag behind urban ones in education all over the world, and it goes beyond the scope of this paper to establish whether such gaps are particularly salient in Thailand. As reported by World Bank (2012), while employers are concerned about a lack of basic and technical skills, enterprise surveys also indicate a shortage of unskilled production workers. Hence, there is little doubt that there are a fair number of

[18] This positive role has a slight downside. While it helps obtain contributions from those who would otherwise not be employed at all and cushions the impact of negative shocks, it might make it harder to kick start a recovery, since the pool of surplus labor available for hiring when things turn around might be quite shallow in Thailand as workers who have lost their jobs and migrated to rural areas may take time to come back to factories.

[19] The problems in Thailand's education system go beyond rural schools. While primary and secondary enrollment rates are fairly high, Thailand ranks number 90 in the world in terms of education quality (World Economic Forum, 2014). Various reports (e.g., OECD, 2013) document low teaching standards, emphasis on rote learning, and insufficient focus science, technology, engineering, and mathematics (STEM) as well as foreign languages. Moreover, several observers have noted the need to better align vocational training with the demands of the labor market.

factory and service sector jobs that current farm workers would be able to perform.[20] Perhaps they would not be as productive there as the average manufacturing worker, but more likely than not their value added would be higher than in agriculture.

The reasons why more agricultural workers do not avail themselves of such opportunities may have to do with information dissemination, city conditions, and attitudes. Interviews with Thai Ministry of Labor officials suggest that, while each province has an information center with ample resources for job search, distance might prevent a considerable number of rural dwellers from utilizing those centers. Information about vacancies is also available online, but the ability of farm workers to access and process that information efficiently is uncertain. Other deterrents to mobility might be a higher cost of living, traffic, pollution, and other factors associated with city dwelling. In most countries the urban lifestyle tends to be perceived as more attractive than the rural one, particularly by the younger people, but Thailand may well be different, and the present paper does not examine these cultural possibilities. It is also true that agricultural workers in Thailand tend to be older than those employed in other sectors, and the older generation may be attached to the traditional lifestyle.

International labor migration could play a role in boosting agricultural employment in Thailand, although evidence on that score is not clear. Thailand hosts about one and a half million registered migrant workers and, reportedly, an even larger number of unregistered migrants. The bulk of them are unskilled workers coming from Myanmar, Lao, and Cambodia—countries where the majority of the population is engaged in agriculture. Thus one might expect that most migrants would be working on Thailand's farms. However, available data do not support that conjecture. According to a detailed study by the International Organization for Migration (Huguet and Chamratrithirong, 2011), "[m]igrants work in a range of low-paying and difficult jobs. Fifteen per cent of them work on fishing boats or in seafood processing, 17 per cent work in agriculture, 17 per cent in construction, 8 per cent in domestic employment and 43 per cent in a range of other businesses." Thus, it appears that the share of migrants working in agriculture and fishing is actually somewhat smaller than that of the native population. At the same time, migration statistics are not very reliable, and it is not unlikely that a considerable fraction of undocumented migrants are employed in agriculture. Beyond sectoral distribution, it is quite clear that education, skill level, and productivity of most migrants are considerably below those of the average Thai worker.

The factors listed above may explain why for many years Thailand has had a higher share of employment in agriculture than most Asian and other middle-income economies. They do not necessarily explain the deceleration in the pace of structural transformation that started in the 2000s and the pickup in rural employment in the last few years. These developments are likely attributed to the evolution of global agricultural prices and to government policies.

[20] This is not to discount the fact that better education in rural areas would be highly beneficial.

As elaborated in the model, an increase in agricultural prices would raise returns to farmers and, other things being equal, would draw more workers into the sector. This is what likely happened in the 2000s, which saw a strong upswing in global food prices. On top of that, the government introduced a number of programs to support the farmers.

A much scrutinized rice pledging scheme was launched in October 2011, guaranteeing rice farmers a price considerably higher than that prevailing in the world market.[21] It provided a clear incentive to the four million rice farmer households to expand production. And it may well have stopped some of those who considered leaving for alternative occupations from doing so and drawn some hired labor into the rice sector. That policy may account for the latest uptick in Thailand's agricultural employment share. It is important to note that a rice pledging program with a pledge value below that set in 2011 but still significantly above the market price was in place for most of the 2000s. Between 2009 and 2011 it was replaced by an income guarantee program, which did not provide an incentive to expand rice production and thus was less distortionary, but still paid people for staying on a farm and hence reduced the incentive to relocate. And people react to incentives and price signals, as can be seen from the fact that the removal of export taxes on rice in the mid-1980s reversed the trend decline in the agricultural share of employment (Figure 2). Moreover, while the rice scheme has achieved considerable notoriety lately, price support schemes have also been operating for other commodities.[22] Price support for rubber was introduced after the rubber farmers demanded equal treatment with rice farmers, while sugar producers have been insured against price declines (at the expense of the consumers) for many years now.[23]

In addition, the minimum wage may provide a barrier to the flow of labor into city jobs. It is enforced more strictly in the formal sector, and thus has a larger direct impact on industry than on agriculture and less formal services. As suggested by the model, a worker whose productivity in manufacturing would be lower than the minimum wage would not find employment there even if his productivity in agriculture is lower still. The minimum wage in Thailand was quite low until a sharp two-step increase in 2012−13. Hence, it cannot account for the productivity differentials and high agricultural employment in the preceding years, but may have contributed to the recent uptick in the latter. Anecdotal evidence suggests that the increase in the minimum wage has triggered a movement of some recent rural-urban migrants back into agriculture, particularly in poorer parts of the country such as the Northeast, where the

[21] Technically, the farmers used rice as collateral to obtain a loan rather than selling it to the government. However, with the value of the collateral set much above the market price, it was optimal for the farmers to default on the loan (which was non-recourse, with a government guarantee) and forfeit the collateral.

[22] While this is not central to our analysis, it is worth pointing out that selected price intervention may also lead to a misallocation of resources *within* agriculture.

[23] In the latest *Global Competitiveness Report* released by the World Economic Forum, Thailand ranks 124th in terms of agricultural policy costs.

minimum wage is more binding. After the increase, Thailand's global competitiveness ranking on labor market flexibility by the World Economic Forum went from 44 in 2011 to 120 in 2013 (and then rebounded slightly to 113 in 2014).

The last issue we take up is that of measurement. How accurately are agricultural outputs and labor inputs measured? The agricultural sector plays the role of an employer of last resort, and it is possible that those who have lost or cannot find a job in the city stay in rural areas doing very limited work or engaging in subsistence farming, adding to the measured labor input but not so much to output. Paavo and Poapongsakorn (2012) argue that a number of biases result in a gross overstatement of agricultural employment. They claim that much of it is irregular or seasonal; that for a variety of reasons many people whose primary occupation is elsewhere report themselves (or are reported by their family members) to be agricultural workers; and that many of those classified as farmers in the Labor Force Survey work on land only a very limited number of hours. Such biases would overstate agricultural labor share and understate agricultural productivity. Also, to the extent that people counted as farmers actually contribute to output in other sectors of the economy, productivity in those sectors would be exaggerated. Making a number of adjustments to official statistics, Paavo and Poapongsakorn (2012) conclude that the actual number of active full-time farmers is at most 27−32 percent of total workforce. This is a dramatic correction to the official number of 38−39 percent.

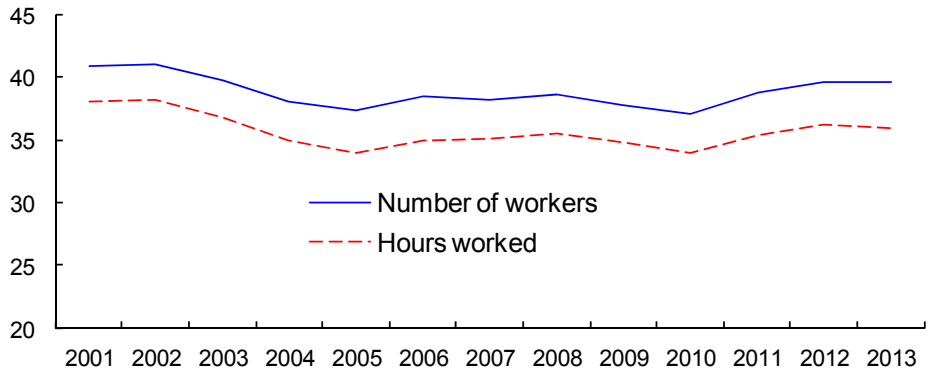
We believe, however, that the extent of the statistical problem is overstated. With the Labor Force Survey conducted monthly, those who are engaged in agriculture for part of the year and in other sectors at other times should be correctly classified in each period, contrary to the widespread belief that such people are uniformly recorded as agricultural workers for the whole year. Of course, respondents to the survey may misstate their occupation, but it is not clear why they would do so intentionally in large numbers, with the bias always going in one direction. Moreover, Thailand is such an outlier in international comparison, that even the number at the low end of the Paavo and Poapongsakorn range is still about 5 percentage points higher than typical for a middle-income Asian economy.

Productivity comparisons across sectors may be distorted by focusing on value added per worker if there are large differences in average hours worked per employee in different industries. Thailand does not publish labor input in terms of total hours worked or average hours per worker in different sectors. The NSO does report the number of workers whose hours fall into certain ranges, by industry. Making assumptions about the distribution of hours within those ranges, one can calculate a proxy for total hours worked in each industry. We show the results in Figure 14. It is indeed true that average hours per worker are lower in agriculture than in the other sectors, but the difference is not dramatic, and switching from workers to hours reduces the share of agriculture in employment by about 3 percentage points and lowers the productivity gap between industry and agriculture by 10–15 percent.[24] It should also be noted

[24] Our numbers are quite close to those reported by Lathapipat and Chucherd (2013).

that in those comparator countries where working hours by industry are available, such as Indonesia and Malaysia, average hours per worker in agriculture are also shorter than in industry, and by a bigger margin than in Thailand.

Figure 14. Thailand: Share of Agriculture in Employment
(In percent)



Source: National Statistical Office; and author's calculations.

A separate statistical issue is migration. Thailand hosts a large number of undocumented migrants from neighboring countries, and it is not clear to what extent these workers are captured in the Labor Force Survey. In the likely case that their output is recorded better than their input, measured productivity may be biased upward as some of the value produced by the migrants would be attributed to Thai workers. The impact that issue has on measured relative productivity across sectors depends on where the migrants are employed. As mentioned above, evidence suggests that migrant workers are spread fairly widely across the economy, so there is no obvious bias, but more information would be useful.

VIII. Policy Implications

Our analysis suggests that considerable gains in productivity could be realized by facilitating a shift of workers from agriculture into more modern sectors. Many of the factors contributing to Thailand's suboptimal resource allocation are under the control of policymakers or can be influenced by them.

The government has recently taken the right step and abolished the rice pledging scheme. The rice scheme had several flaws and proved to be highly wasteful. A price guarantee that rewards a low-productivity activity and draws additional workers into agriculture hinders Thailand's modernization. The same logic applies to price support for rubber (recently ended) and sugar.[25]

[25] Many advanced economies buttress their agricultural sectors through various means, including price guarantees, income support, subsidized insurance, cheap credit, and trade restrictions. However, those sectors are rather small, and they were supported much less, or even were taxed heavily to subsidize modernization, in earlier stages of development.

This does not mean that agriculture and agricultural workers should be left to their own devices. Instead of guaranteeing an above-market price, the government could help cushion the impact of market price fluctuations by facilitating the development of price insurance markets. Support for low-income members of society should be provided through broad social safety nets including through conditional cash transfer programs; access to such support should not be linked to residence or occupation. Efforts should be directed at facilitating the transition of farm workers into more modern employment via appropriate education, training, social services, and information dissemination rather than at protecting agricultural jobs. Of course, there may be people who cherish rural life for its own sake and would not be willing to move no matter what the opportunities elsewhere. If such are their preferences, the government of course should not try and uproot them. At the same time, the government should not subsidize a certain lifestyle, which may not be economically viable, at the expense of others.

On the education front, steps are being taken to modernize the curriculum and teaching techniques, with more emphasis on math, sciences and foreign language and on developing creative thinking rather than rote memorization. Solutions are being sought for the issues besetting rural schools, including lower teacher quality and their small scale (which leads to combining students of different ages in one class). These efforts should be stepped up, while vocational training needs to be better aligned with the needs of the employers as suggested by World Bank (2012).

At the same time, opportunities in the rural areas should be enhanced. Paavo and Poapongsakorn (2012) make a number of suggestions for improving agricultural productivity. They include establishing a more efficient, incentive-based system of water management; improving agricultural research and knowledge transfer systems; and reforming land sales and tenancy laws. The last measure in particular would facilitate exit of those with marginal attachment to land and consolidation of land holdings allowing the introduction of modern, large-scale operations. Robust agricultural productivity growth can go hand-in-hand with labor outflow into other sectors (as it did in the decade preceding the Asian financial crisis), leveling productivity differentials across sectors and contributing to economy-wide productivity growth both through intra-sectoral growth and through the reallocation channel.

A move toward modernity should not necessarily imply a major physical relocation. Continued expansion of agro-manufacturing, including food processing, would allow Thailand to move up the value chain, complementing the spread of large, efficient farms. Developing infrastructure—power, transportation, communication—throughout the country would make it easier for people in all parts of Thailand to connect to the modern economy in productivity-enhancing ways. This would also help reduce regional income disparities.

A cost of hiring in excess of productivity may be a barrier to expansion of firms in the formal sector—not just manufacturing, but also modern services—subject to the minimum wage. From that point of view, the introduction of a uniform minimum wage across the country may render low-skilled workers not employable in the formal sector, particularly in the poorer parts of the

country. A related issue is that formal-sector firms may be reluctant to incur the cost of training newcomers, as their competitors may benefit from that training should the newcomer move after acquiring the skills. The government could help alleviate this potential market failure by waiving or reducing the minimum wage for apprentices or offering temporary tax breaks or other incentives for firms hiring newcomers into the formal labor market. Alternatively, or in addition, private business associations may devise schemes that would subsidize on-the-job training.

IX. Conclusions

Evidence presented in this paper demonstrates that Thailand has an exceptionally high dispersion of productivity across sectors and an exceptionally large share of its population engaged in agriculture for a country at its level of income. To some extent this reflects the useful role of the employer of last resort that the agricultural sector plays, providing jobs for those who otherwise would be unemployed or out of the labor force. But mostly these facts suggest sizable potential gains from reallocating labor from agriculture into more modern activities. However, that process appears to have stalled in recent years. A broad increase in food prices over the last decade may have contributed to that, but government policies, particularly the rice pledging scheme and predessor programs, have likely played a role as well.

The inefficient allocation of resources reduces Thailand's standard of living. The government could facilitate growth-enhancing structural transformation by removing agricultural price supports; gearing the education system, particularly in the rural areas, toward acquiring knowledge and skills requisite in the modern economy; disseminating information about available opportunities; facilitating hiring of newcomers to the formal sector (including by waiving the minimum wage); and increasing infrastructure investment. Important steps have been taken recently on some of these fronts (including the abolition of the rice pledging scheme and the price support for rubber as well as certain educational initiatives), and futher advances would be useful.

While we argue that a reduction in agricultural employment would be in Thailand's best interests, we advocate support for the agricultural sector rather than neglect. Measures that increase agricultural productivity can and should be undertaken in parallel with those that remove barriers to worker movement out of that sector. Thailand's natural advantages make it a good place for food production, but agriculture should develop through the intensive rather than extensive margin. A faster transition up the value chain to food processing would be advisable. Low-income rural households should be supported in accordance with the principle of protecting workers, not jobs, through broad social assistance not linked to a particular location or occupation.

Thailand has been successful at avoiding social problems frequently associated with rapid rural-urban migration, such as the emergence of city slums and high youth unemployment. Agriculture continues to provide an informal safety net, absorbing excess labor in case of

negative shocks. At the same time, there are considerable gains to reap from shifting a larger proportion of Thailand's population into nonagricultural activities within a broader strategy of moving up the value chain. Policies that combine appropriate incentives, information dissemination and training, accommodative conditions for newcomers to the cities, and broad formal safety nets would help realize those gains without social strain.

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Appendix I

Productivity Growth Decomposition

Average productivity (output per worker) equals the weighted average of sectoral productivities, with the weights given by sectoral labor shares.

$$P_t = \frac{Y_t}{L_t} = \frac{\sum Y_t^i}{L_t} = \sum \frac{Y_t^i}{L_t} = \sum \frac{L_t^i}{L_t} \frac{Y_t^i}{L_t^i} = \sum S_t^i P_t^i$$

Change in economy-wide average productivity over a span of time can be decomposed into the sum of three terms:

$$P_t - P_0 = \sum S_t^i P_t^i - \sum S_0^i P_0^i = \sum S_0^i P_t^i - \sum S_0^i P_0^i + \sum S_t^i P_t^i - \sum S_0^i P_t^i = \sum S_0^i \left(P_t^i - P_0^i\right) + \sum \left(S_t^i - S_0^i\right) P_t^i =$$
$$= \sum S_0^i \left(P_t^i - P_0^i\right) + \sum \left(S_t^i - S_0^i\right) P_0^i + \sum \left(S_t^i - S_0^i\right)\left(P_t^i - P_0^i\right)$$

The first term aggregates *productivity growth within sectors*, using beginning-of-period employment shares as weights. The second term captures *intersectoral reallocation* of labor. It will be positive if more people get employed in higher-productivity sectors and negative otherwise. The third term captures *interaction* between intrasectoral growth and intersectoral reallocation. It will be positive if workers on average move into sectors experiencing faster productivity increases.[26] The second and third terms are associated with structural change in the economy. To convert level change to productivity growth rate in the above formula, we divide the total and each term therein by the initial economy-wide productivity P_0.

[26] The interaction term, being the product of two changes, tends to be relatively small.