Structural Transformation: An Overview

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Background: **Aggregate Models of Growth and Development**

Benchmark model is the one sector growth model.

Key element is the production function:

$$Y_{it} = A_{it}F(K_{it}, E_{it})$$

$$E_{it} = G(H_{it}, S_{it}, \ldots)$$

Two prominent themes in the literature:

- Theoretically: Balanced growth, motivated by Kaldor facts
- Empirically: Development accounting/growth accounting

Messages from these Literatures

- Balanced growth can be obtained under “reasonable” conditions:
  - technological progress must be labor augmenting
  - require some restrictions on preferences
- Productivity is key:
  - Productivity growth drives long run growth for today’s rich economies
  - Dominant (proximate) source of low income per capita among poor countries is low productivity.

Is the One Sector Model Relevant/Sufficient for Development?

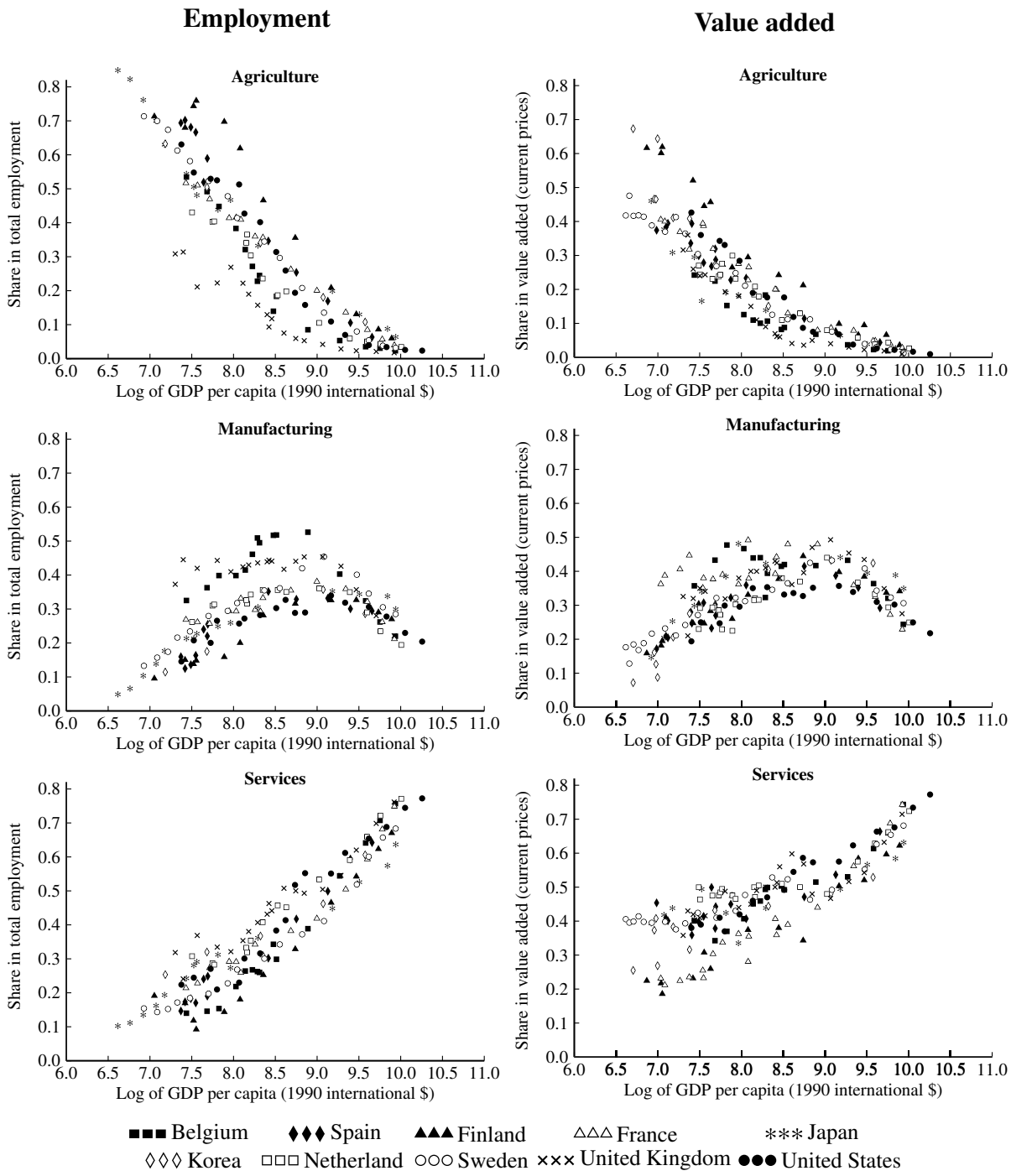
The one sector model abstracts from many features of reality.

This is both a virtue and a vice.

One feature it abstracts from is structural transformation–the reallocation of economic activity across broad economic sectors that accompanies development.

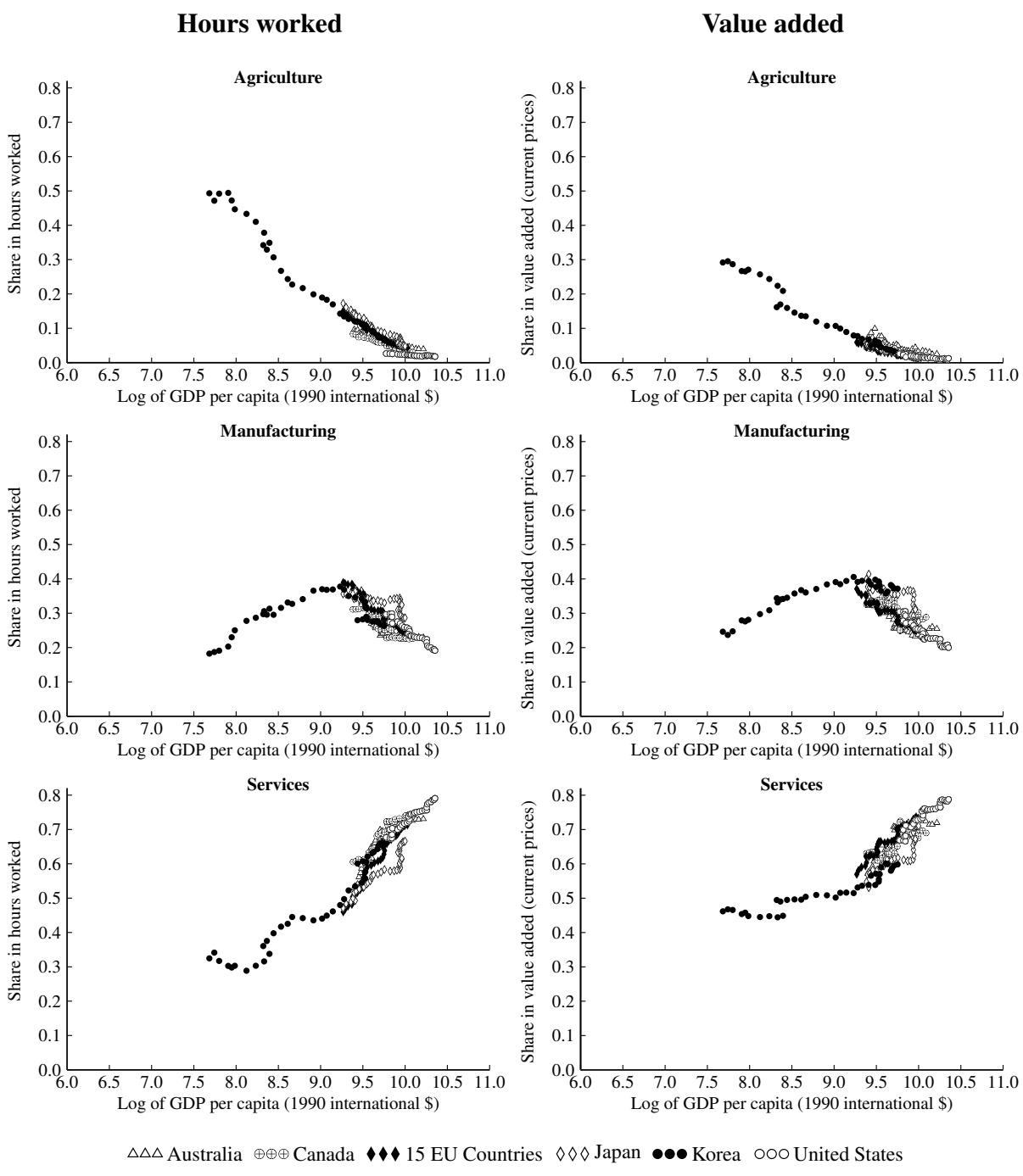
Kuznets included this as one the six key stylized facts of development.

Figure 1: Sectoral Shares of Employment and Value Added – Selected Developed Countries 1800–2000



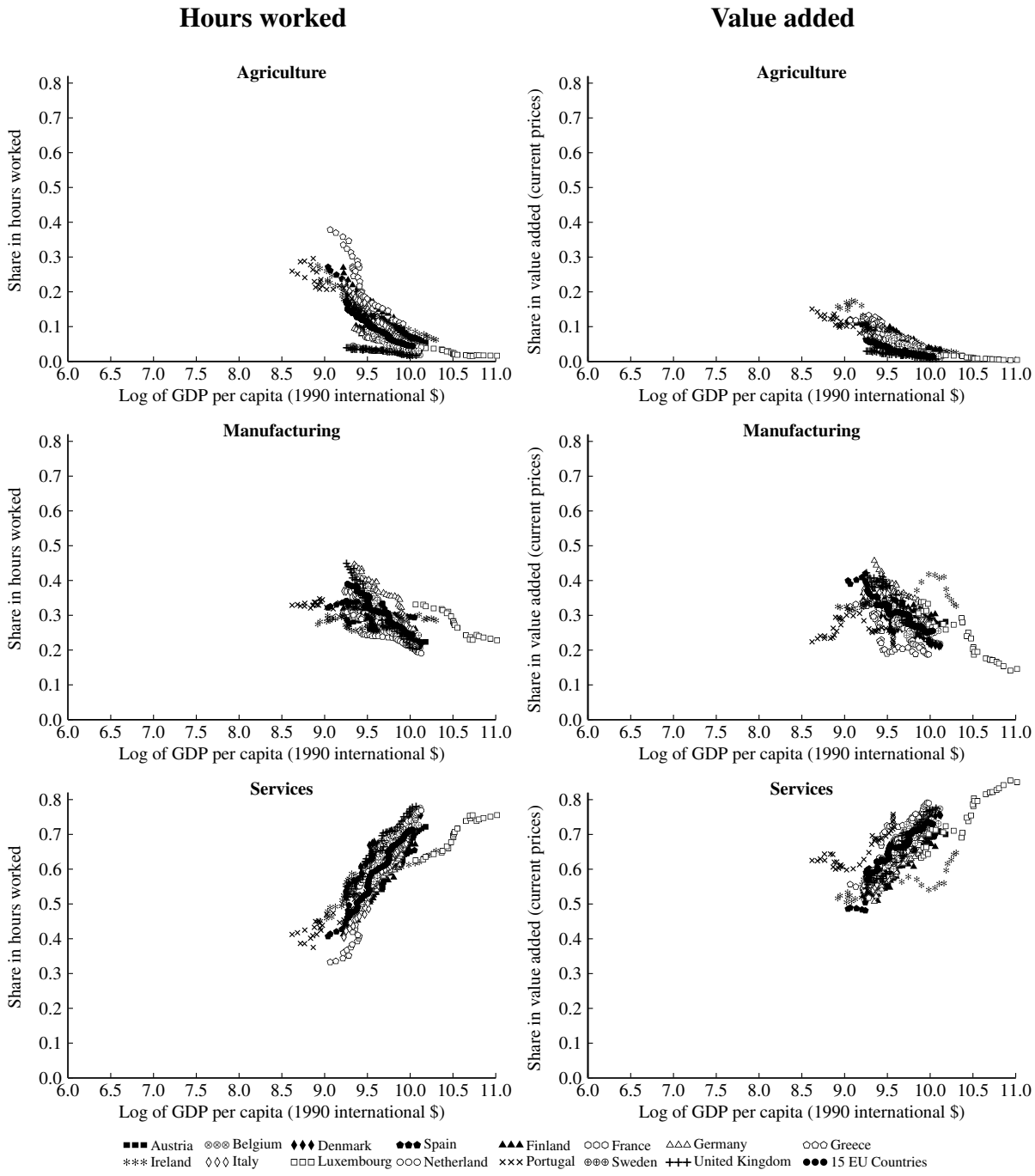
Source: Various historical statistics, see Appendix A.

Figure 2: Sectoral Shares of Hours Worked and Nominal Value Added – 5 Non–EU Countries and Aggregate of 15 EU Countries from EU KLEMS 1970–2007



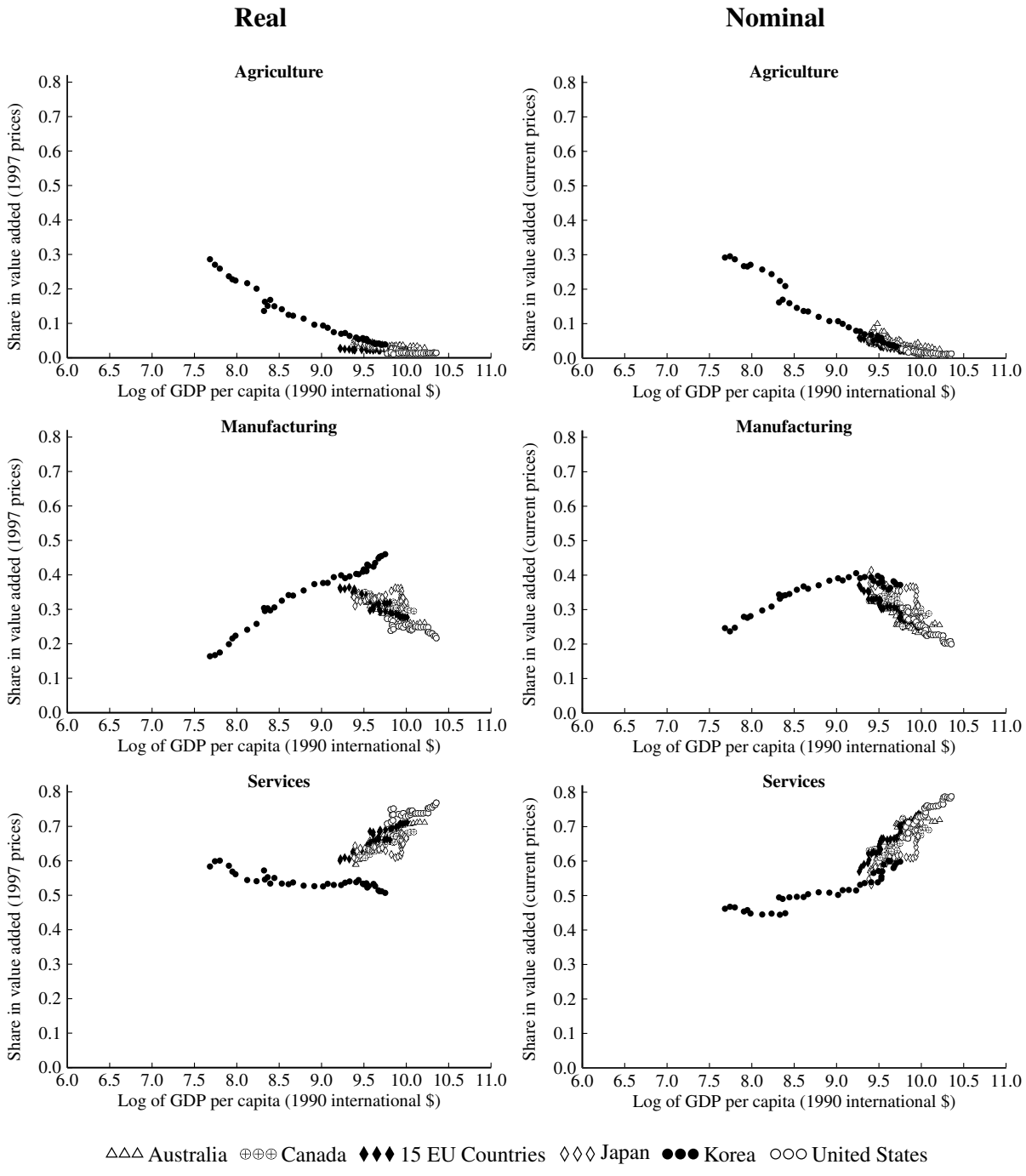
Source: EU KLEMS, PWT6.3

Figure 3: Sectoral Shares of Hours Worked and Nominal Value Added – 15 EU countries from EU KLEMS 1970–2007



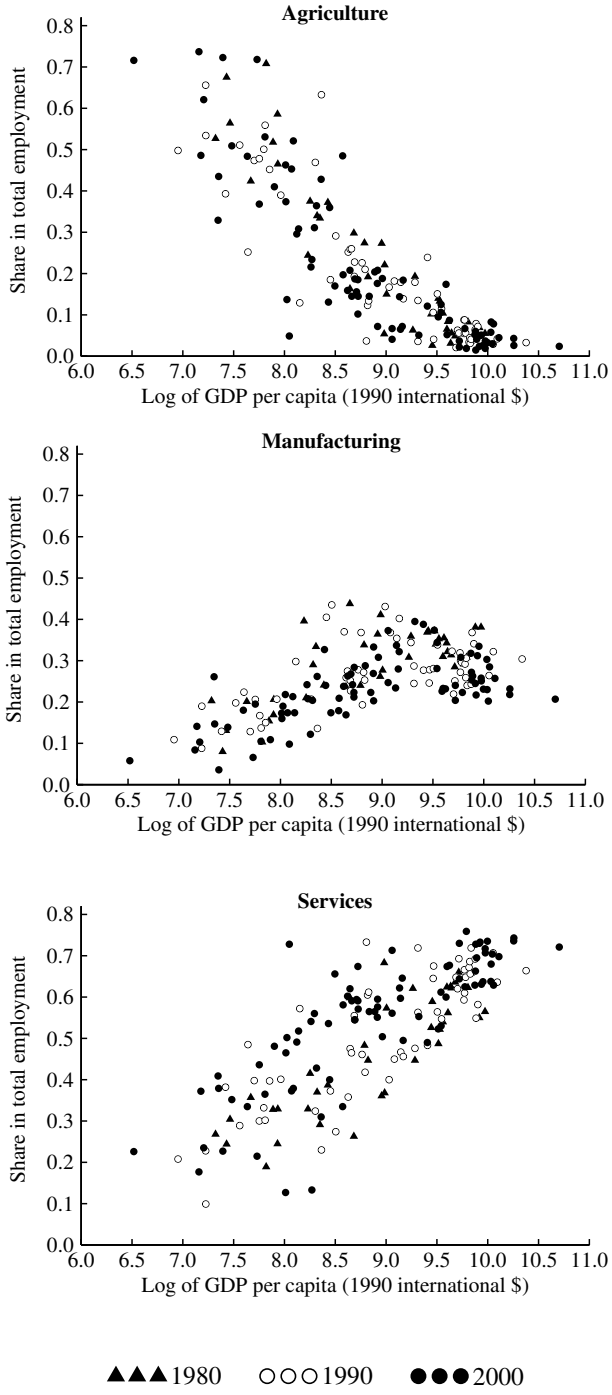
Source: EU KLEMS, PWT6.3

Figure 4: Sectoral Shares of Real and Nominal Value Added –
5 Non–EU Countries and Aggregate of 15 EU Countries from EU KLEMS 1970–2007



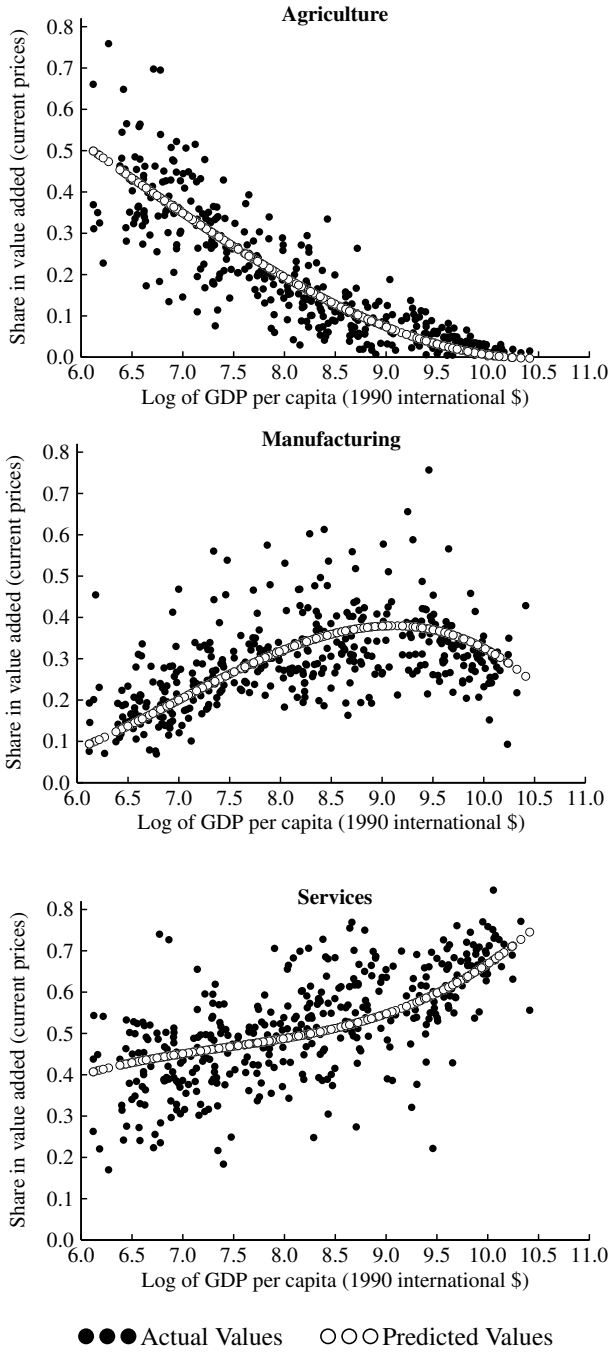
Source: EU KLEMS, PWT6.3

Figure 5: Sectoral Shares of Employment –
Cross Sections from the WDI 1980–2000



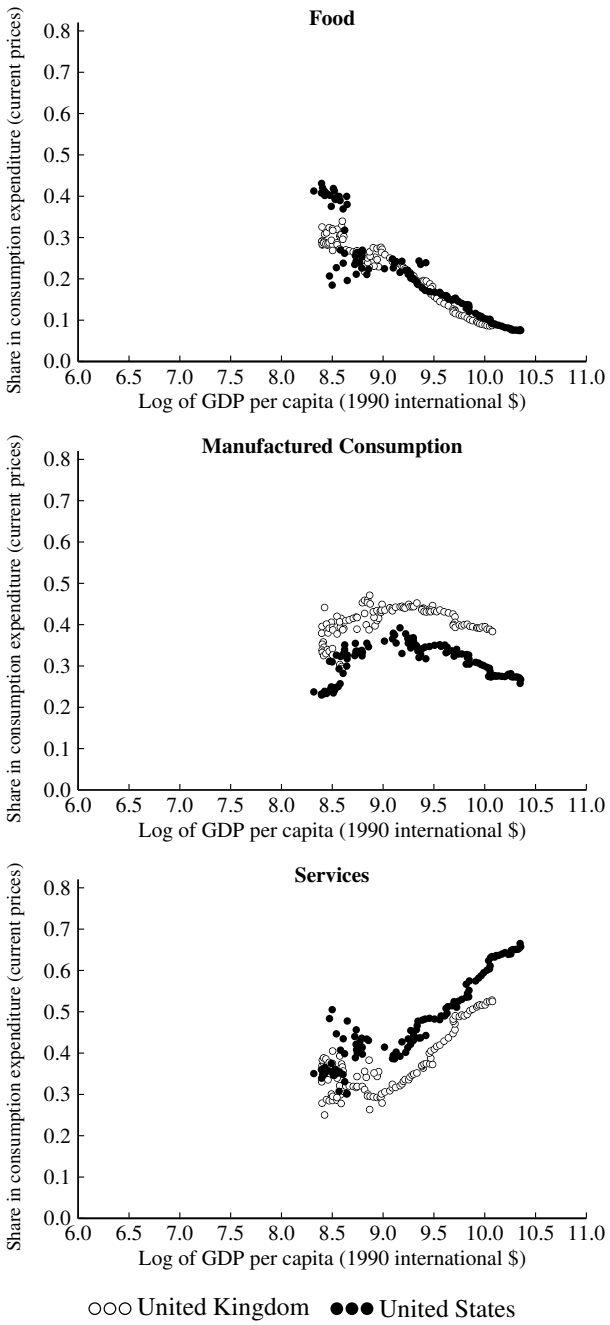
Source: World Development Indicators 2010

Figure 6: Sectoral Shares of Nominal Value Added – Cross Sections from UN National Accounts 1975–2005



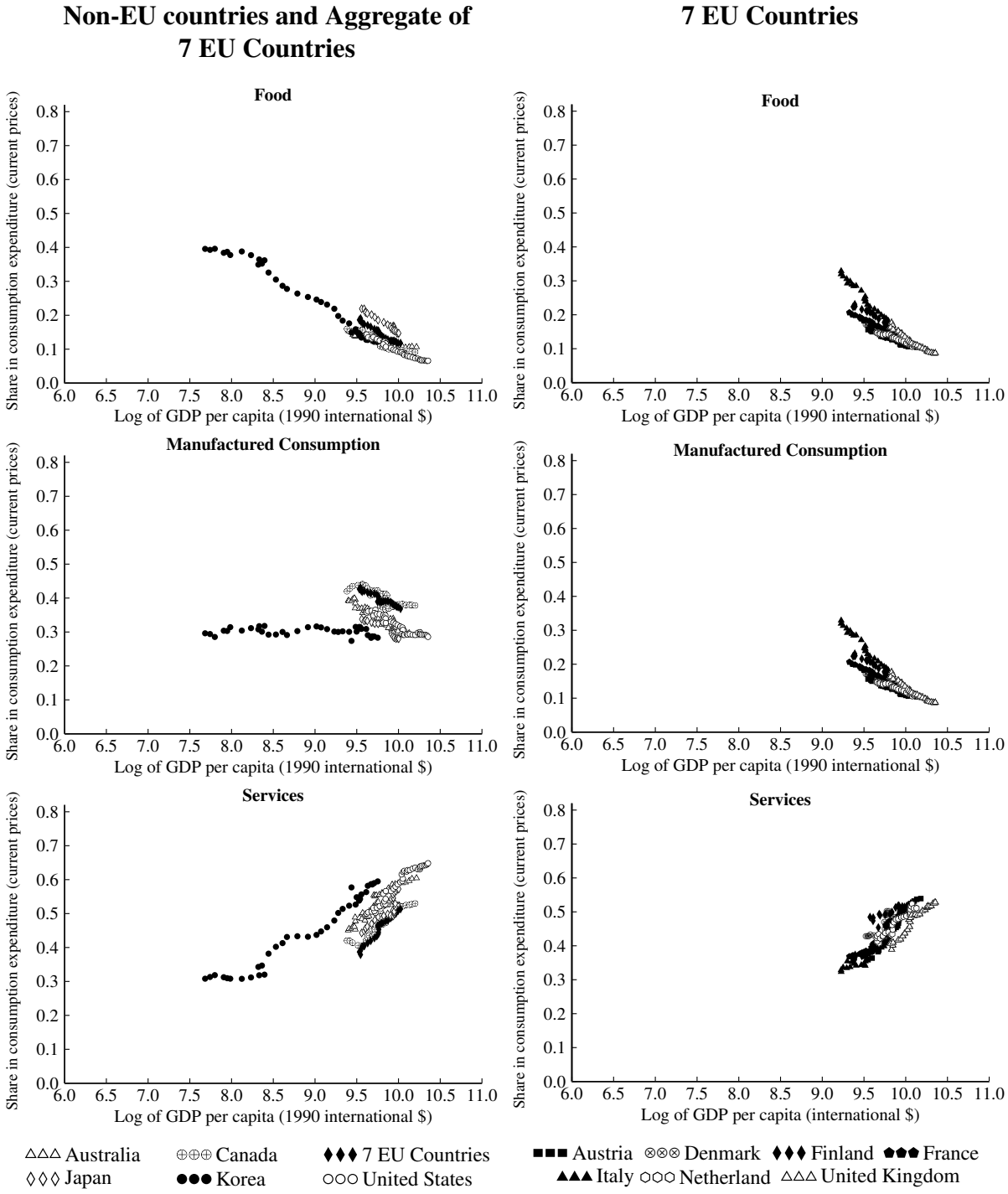
Source: National Accounts United Nations, PWT6.3, own calculations

Figure 7: Sectoral Shares of Nominal Consumption Expenditure – US and UK 1900–2008



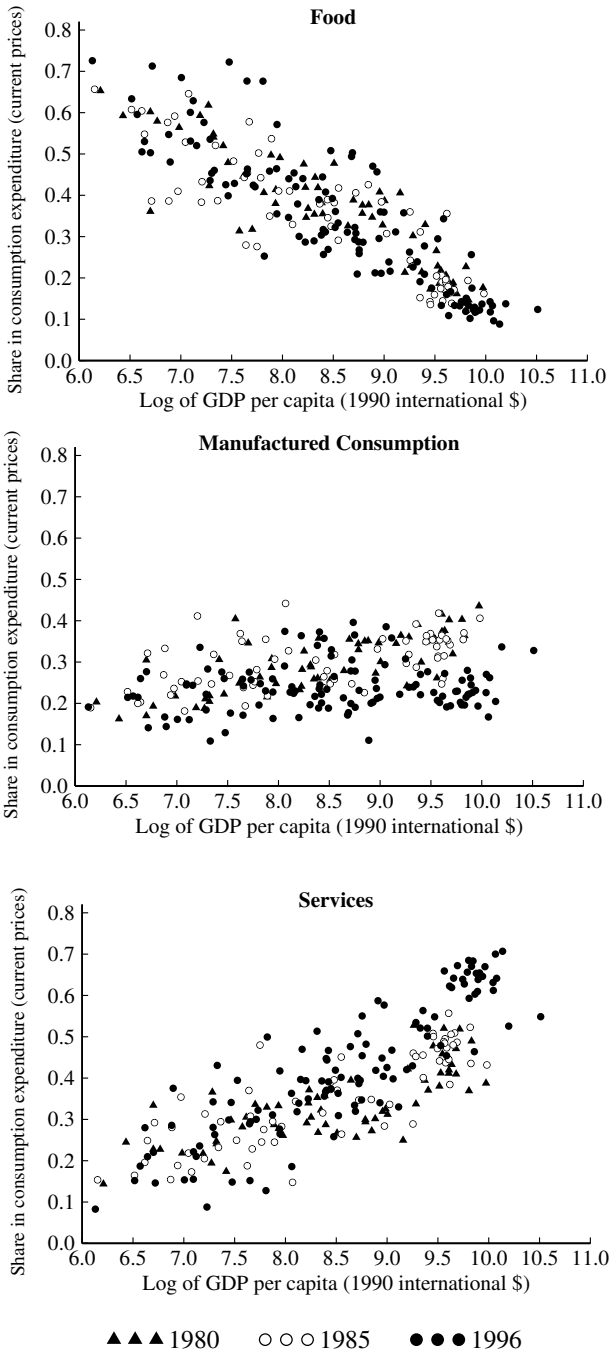
Source: Various historical statistics, see Appendix A.

Figure 8: Sectoral Shares of Nominal Consumption Expenditure – Various Countries, OECD 1970–2007



Source: OECD, EU KLEMS, PWT6.3

Figure 9: Sectoral Shares of Nominal Consumption Expenditure – Cross Sections from the ICP Benchmark Studies 1980, 1985, 1996



Source: International Comparisons Programme (as reported in PWT)

Can a model that abstracts from such a prominent empirical regularity be useful?

Does structural transformation mean that balanced growth is a misguided concept?

Does it make sense to interpret outcomes in rich and poor countries using a common aggregate production function, when one group is primarily engaged in production of services like health care, education, FIRE, whereas the other group is engaged in subsistence agriculture?

These questions (and others like them) suggest the desirability of a benchmark framework that simultaneously addresses both highly aggregated facts (like the Kaldor facts) as well as the facts about structural transformation.

Modelling Growth and Structural Transformation:

Framework

- Closed economy
- Infinitely lived representative household
- Preferences:

$$\sum_{t=0}^{\infty} \beta^t \log C_t$$

$$C_t = \left[\omega_a^{\frac{1}{\varepsilon}} (c_{at} - \bar{c}_a)^{\frac{\varepsilon-1}{\varepsilon}} + \omega_m^{\frac{1}{\varepsilon}} (c_{mt})^{\frac{\varepsilon-1}{\varepsilon}} + \omega_s^{\frac{1}{\varepsilon}} (c_{st} + \bar{c}_s)^{\frac{\varepsilon-1}{\varepsilon}} \right]^{\frac{\varepsilon}{\varepsilon-1}}$$

- Technology:

$$c_{it} = k_{it}^{\theta}(A_{it}n_{it})^{1-\theta}, \quad i \in \{a, m, s\}$$

$$X_t = k_{xt}^{\theta}(A_{xt}n_{xt})^{1-\theta}$$

$$K_{t+1} = (1-\delta)K_t + X_t$$

$$K_t = k_{at} + k_{mt} + k_{st} + k_{xt}$$

$$1 = n_{at} + n_{mt} + n_{st} + n_{xt}$$

(**Generalized**) **Balanced Growth and Structural Transformation**

The literature has identified two basic specifications of the above model that can generate (generalized) balanced growth with structural transformation:

- Kongsamut, Rebelo and Xie (2001)
- Ngai and Pissarides (2007)

Both rely on technological progress to generate aggregate growth, but offer different mechanisms for what drives structural transformation.

Mechanisms Underlying Structural Transformation

Kongsamut et al has technological progress that is uniform across sectors and relies on income effects in demand to generate reallocation of labor and structural transformation (i.e., slopes of Engel curves drive structural transformation)

Ngai and Pissarides require uneven technological progress across sectors, thereby generating relative price movements, and relies on a non-unitary elasticity of substitution between sectors to generate reallocation of labor and structural transformation. (To fit the data this theory requires that technological change is greatest in ag and lowest in services.)

Evaluating the Two Mechanisms

Three simple questions:

1. How important are the two mechanisms in a relative sense?

2. Does it matter?

3. Can these two mechanisms account for the key features in the data?

One theory emphasizes income effects, the other emphasizes relative price effects. Should be easy to empirically assess them.

Turns out it is somewhat more subtle than one might imagine.

- Key issue is treating production and consumption quantities consistently
- Different representations of the data display can display different properties

Bottom line: not so easy to definitively assess the relative importance.

Each also has limitations vis-a-vis the data: nominal versus real shares.

Comment on Role of Balanced Growth

To the extent that both mechanisms are empirically relevant, it is worth noting that a model that combines both mechanisms is not consistent with balanced growth.

It seems reasonable to conclude that we should think about requiring “approximate” balanced growth instead of “exact” balanced growth.

What Insights Do We Gain from this Richer Framework?

At the broadest level, basic message remains the same: productivity is key.

But we now have a more nuanced view.

Aggregate productivity now depends on the profile of sectoral productivities and the profile of how resources are allocated across the sectors.

This has interesting implications for different phases of structural transformation, but today I focus on the transition out of agriculture.

Implications for the Transition Out of Agriculture: **Productivity Growth**

Data suggests that the world's poorest countries are particularly unproductive in agriculture at the same time that they have most of their labor force working in agriculture.

The theories described earlier both have the implication that particularly low productivity in agriculture leads to greater allocation of resources to agriculture.

Whereas the one-sector model simply says that higher productivity is good, these models suggest that productivity improvements in different sectors have different consequences depending on the stage of development.

Implications for the Transition Out of Agriculture: **Measuring Distortions**

The previous models explain how structural transformation is part of an efficient dynamic allocation in the face of technological change.

But today's poorest countries may well have various distortions that result in inefficient allocations across sectors in a static perspective.

These models can help guide these types of investigations.

Do wage setting distortions prevent workers from leaving agriculture because jobs are not available?

Are there other restrictions to mobility?

Future Work

We need additional studies to assess the role of various factors in shaping structural transformation. But this is challenging because of data issues.

More generally, we need more studies to understand how policies/institutions shape productivity growth.