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Symposium on Misallocation and Structural Transformation:  
Introduction

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# Symposium on Misallocation and Structural Transformation: Introduction<sup>†</sup>

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Our motivation for a *Symposium on Misallocation and Structural Transformation* is that the processes of resource allocation and structural change are, each individually and jointly, interwoven with the process of economic growth and development. The common thread that transpires these processes is the allocation of economy-wide inputs across production units (sectors, firms, farms, regions, tasks). There is a growing recognition that this allocation and how it interacts with input accumulation and within unit productivity growth is at the heart of economic growth. Understanding the mechanisms and underlying forces that lead to resource misallocation and structural change are crucial for interpreting how today's developed economies came to be, but particularly critical for today's lower income countries, for which growth and development remain elusive, and concrete policy guidance is paramount.

A fundamental inquiry within the discipline of economics pertains to the determinants underly-

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ing why some countries are rich and others poor. The magnitude of the disparity in income per capita across nations is extremely large, a factor of more than 30-fold between the richest and poorest countries in the world (Jones, 2016). The welfare implications associated with closing this income gap are staggering, which necessitates understanding the fundamental sources of these great disparities and the associated policy implications. A consensus in the literature has centred around the importance of labor productivity, and in particular total factor productivity (TFP), the effectiveness with which countries can turn given amounts of inputs such as capital and labor into output, in accounting for a substantial portion of the differences in income across nations (Klenow and Rodriguez-Clare, 1997; Prescott, 1998). Consequently, an essential follow-up question pertains to the fundamental drivers of differences in aggregate productivity across countries.

A major area of research in macroeconomics over recent decades has revolved around the quantitative examination of the role for aggregate outcomes of resource allocation across heterogeneous production units within sectors (Restuccia and Rogerson, 2008; Hsieh and Klenow, 2009) and sectoral structural transformation (Gollin et al., 2002; Duarte and Restuccia, 2010). These examinations are motivated by empirical findings illustrating wide differences among nations in the operational scale in production such as farm size in the agricultural sector or establishment size in the nonagricultural sector (Adamopoulos and Restuccia, 2014; Bento and Restuccia, 2017, 2021) and the disparities both in sectoral productivities and stages of structural transformation among nations (Caselli, 2005; Restuccia et al., 2008; Duarte and Restuccia, 2010).

Considering production heterogeneity within sectors is motivated by the fact that in developed countries the reallocation of factors of production across production units explains a large chunk of productivity growth over time (Baily et al., 1992; Foster et al., 2008). If resources are misallocated across production units, aggregate productivity can be low even in situations when aggregate resources are constant. This analytical framework has proven invaluable, as it unveils instances where ostensibly homogenous macroeconomic environments across nations belie substantial heterogeneity in the effective returns or costs confronting producers, thereby exerting

heterogeneous impacts on resource allocation patterns and aggregate outcomes ([Hopenhayn, 2014](#); [Restuccia and Rogerson, 2017](#)). For instance, variations in regulatory frameworks and institutional and policy environments may engender disparate cost structures and market conditions for different producers, thereby influencing an allocation of resources that depresses productivity in the aggregate. The exploration of potential misallocations across production units within sectors has uncovered numerous instances wherein even well-intentioned policies or institutional frameworks generate substantial negative effects on aggregate productivity levels.

A wide variety of policies and institutions in developing countries can distort factors of production across producers. Broadly speaking, the literature on misallocation has followed two approaches in quantifying its effects on aggregate productivity. The indirect approach uses a canonical model of heterogeneous firms and backs out the extent of misallocation from disparities in marginal products across producers, an approach popularized by the seminal work of [Hsieh and Klenow \(2009\)](#). This approach has revealed considerable degrees of misallocation in many different sectors and country contexts. The direct approach identifies specific policies, institutions, or frictions causing misallocation, measures them, and using structural models quantifies their implications. The research program under this approach has unveiled the role of labor market policies ([Hopenhayn and Rogerson, 1993](#)), size dependent policies ([Guner et al., 2008](#)), credit market imperfections ([Buera et al., 2011](#); [Midrigan and Xu, 2014](#)), land reforms ([Adamopoulos and Restuccia, 2020](#)), market power ([Peters, 2020](#)), among others. See [Restuccia and Rogerson \(2013\)](#), [Hopenhayn \(2014\)](#), and [Restuccia and Rogerson \(2017\)](#) for recent reviews of the literature.

The allocation of resources across broad sectors of the economy can also play an important role in understanding aggregate productivity. It is well documented, at least since the work of [Kuznets \(1957\)](#), that the process of development is accompanied by a process of structural change, whereby the composition of economic activity—measured as employment, value added, or consumption expenditure—shifts from agriculture, to manufacturing, and then services. A substantial amount of research in recent years has documented these patterns for today’s de-

veloped economies over time and has developed macroeconomic models consistent with both the aggregate Kaldor facts and sectoral Kuznets stylized facts (Herrendorf et al., 2014). The literature has focused on mechanisms generating structural change with income effects, through non-homothetic preferences (Kongsamut et al., 2001; Echevarria, 1997); relative price effects through differences in technologies across sectors (Baumol, 1967; Ngai et al., 2019; Acemoglu and Guerrieri, 2008), or both (Boppart, 2014; Comin et al., 2021).

A standard formulation of non-homotheticities generating income effects of structural change are the Stone-Geary preferences, with a minimum requirement of food consumption, which imply that when consumer income is low a disproportionate amount is spent on food—even if relative prices of goods are constant. In a closed economy, these preferences imply that productivity in the agricultural sector is essential in understanding the prevalence of agricultural employment in low productivity countries and the movement of employment out of agriculture associated with agricultural productivity growth. A substantial amount of work documents that agricultural productivity is particularly low in developing countries and seeks to understand why this is, e.g. Restuccia et al. (2008), Adamopoulos et al. (2022). The relative price formulation generates shifts in the composition of economic activity from differences in technological progress or capital intensities across sectors. For example, considering the substitution between industry and services, if productivity growth in industry is faster than in services and the two goods are complementary in consumption, then there is reallocation of employment to services. In this setting, productivity growth in industry outpaces demand for industry goods leading to deindustrialization. A recent literature quantifies the role differences in sectoral productivity growth across countries in generating heterogeneous patterns of structural transformation and aggregate outcomes (Duarte and Restuccia, 2010; Huneus and Rogerson, 2023; Nguyen, 2024).

A related literature studies why labor is slow in moving from rural to urban areas and from agriculture to non-agriculture, despite the large agricultural productivity gap in low income countries (Gollin et al., 2014). The agricultural productivity gap can reflect sectoral selection (Lagakos and Waugh, 2013), or frictions that prevent the movement of labor out of agriculture,

e.g., monetary cost and risk ([Bryan et al., 2014](#)), rural insurance networks ([Munshi and Rosenzweig, 2016](#)), transportation costs ([Asher and Novosad, 2020](#)), and land rights ([Ngai et al., 2019](#); [De Janvry et al., 2015](#)). Recent work by [Adamopoulos et al. \(2024\)](#) shows that insecure land rights over farmland can be an important barrier to the movement of labor out of agriculture and into urban areas, and can have substantial agricultural and aggregate productivity implications when interacted with selection.

An essential finding in the broad literature of structural transformation is the relevance of sectoral productivity in generating reallocation across sectors. As a result, there is natural connection between the policies and institutions that generate misallocation across producers within a sector and hence aggregate productivity effects within a sector, and their impact on structural transformation. That is, the misallocation of resources within a sector can be an important source of heterogeneous paths of structural change, an issue that has predominantly been studied with a focus on the agriculture-nonagriculture split ([Adamopoulos and Restuccia, 2014](#)). Understanding what the fundamental drivers of sectoral productivity, and as a result structural change, is critical for policy guidance. For example, restrictive land markets in less developed countries can depress agricultural productivity by misallocating land and other inputs across farms, constituting a relevant source of productivity that prevents the reallocation of labor out of agriculture and migration from rural to urban areas ([Adamopoulos et al., 2022, 2024](#)). Poor transport infrastructure can also be a source of low agricultural productivity, by limiting spatial specialization and access to intermediate inputs, thus keeping the majority of the population in rural dispersed communities ([Adamopoulos, 2024](#)).

This Symposium is comprised of a great set of papers in the areas of misallocation and structural transformation. While all papers have important implications for economics growth, resource allocation, and structural change, narrowly speaking the first three papers are on resource allocation, while the fourth is on structural transformation. A common methodological attribute of all these papers is the use of micro-level data to study macro-level issues. This is consistent with the recent trend in macro development to use a granular micro-to-macro approach to

understand development from the ground up.

The article by **Castro and Sevcik** (“Occupational Choice, Human Capital, and Financial Constraints”) considers an augmented neoclassical growth model with production heterogeneity to study the aggregate productivity effects of financial frictions. In their framework, credit constraints affect not only production decisions of entrepreneurs, who are restricted in their operational scale, but also dynamic investment decisions on human capital, which in turn affect the productivity of operating firms. In this setting, the misallocation of resources across firms induced by financial frictions depresses the returns to human capital investment, distorts occupational choices (misallocation of talent), and hence alters the firm-level productivity distribution in the economy. All these factors lead to a magnification of the aggregate productivity losses from financial frictions. Castro and Sevcik show that a calibrated version of the model can account for between one-third to two-thirds of the aggregate productivity gap between India and the United States and that the impact of financial frictions on human capital decisions is a quantitatively important source of the aggregate productivity gap.

This article advances our understanding of productivity differences across countries by providing a plausible and quantitatively substantial mechanism linking institutional distortions, such as financial frictions that are more prevalent in less developed countries, to both physical and human capital accumulation, misallocation of resources, and the observed productivity distribution which is affected by human capital investment. As a result, the article provides an important link between the forces of broad capital accumulation, misallocation of resources within a given set of producers, and differences in producer-level productivity distributions, three essential areas of research linked together via differences in financial development across countries.

The article by **Lee and Shin** (“The Plant-Level View of Korea’s Growth Miracle and Slow-down”) analyzes the growth miracle of South Korea between 1967-2000 using micro (plant-level) data for the manufacturing sector. Korea is a relevant case of inquiry since its growth episode is one of the more outstanding experiences of convergence to leading industrialized countries

in the post world-war-II era. For instance, the growth in real GDP per capita between 1967 and 2000 is more than 13-fold, implying an annualized growth rate of more than 8 percent, which contrasts to the growth rate of leading countries of around 2 percent per year. This is a remarkable convergence episode that transformed the average income per person in Korea. An important source of the income convergence is the growth in labor productivity in the manufacturing sector, the focus of Lee and Shin’s article. What factors are responsible for this miracle productivity experience? Learning about this experience may help understand policies and institutions that could be replicated elsewhere. Moreover, it represents an opportunity to assess standard facts for an individual country over time in its process of substantial economic development in contrast with the usual approach of facts involving observations across countries at different points in the development process.

Lee and Shin’s article focuses on analyzing the evolution of the plant size distribution, static allocative efficiency, and business dynamism of the Korean manufacturing sector during its growth miracle (1967-2000) and the subsequent slowdown since 2000. They uncover some important and somewhat puzzling surprising facts. First, the average plant size features an inverse-U pattern over time, with a peak in the late 1970s, whereas comparable data across countries suggests a positive relationship between average plant size and income per capita ([Bento and Restuccia, 2017](#)). Second, efficiency gains (the inverse of allocative efficiency), a standard measure of misallocation in the literature ([Hsieh and Klenow, 2009](#)), decreases modestly until 1983 but increases substantially afterwards. Third, there is no systematic correlation between the growth rate of manufacturing productivity and either the level or the change in average plant size or misallocation. However, business dynamism measured by firm turnover (job creation and destruction) diminished substantially starting in 2000, coinciding with the decline in manufacturing productivity growth.

**Cerdeiro and Ruane** (“China’s Declining Business Dynamism”) study the evolution of business dynamism in China between the period 2003 and 2018. During the sample period China has featured strong growth and substantial economic transformation. Using data for the man-



ufacturing sector, the authors document five facts on business dynamism. First, there is a reduction in the share of output and inputs of young firms. Second, there is a reduction in life cycle growth of firms. Third, there is a decline in life cycle growth of process efficiency / product quality and investment in intangibles . Fourth younger firms have higher capital productivity than older firms, with the gap increasing over time. Fifth, the dispersion of capital growth and the responsiveness of capital growth to capital productivity have both declined. The authors consider a simple model of firm reallocation and growth to estimate that the lower life-cycle productivity growth of young firms reduced manufacturing productivity growth by 0.8 percentage points annually, and worsening allocative efficiency of capital between young and old firms reduced manufacturing TFP by 1.25 percent between the early 2000s and late 2010s. Finally, they document empirically that provinces with larger percentage of state-owned enterprises feature lower business dynamism.

The article by **Cao, Chen, Xi, and Zuo** (“Family Migration and Structural Transformation”) provides a contribution into the process of structural change, and in particular the reallocation of employment out of agriculture and into urban centres in the context of migration decisions by married couples. The migration from rural to urban centres is a prominent feature of economic development. The authors consider a multi-sector model of structural transformation with household decisions and spatial features. Using the economic context of China where spatial reallocation is restricted to the availability of welfare services to registered households, they use detailed household and individual level data to estimate the gender barriers to migration of married couples and their effects on structural transformation, aggregate productivity and gender gaps. An important finding is that qualitatively, the reduction in migration costs contributes substantially to structural transformation. The authors also find important gender differences in migration costs, with substantial effects on structural transformation, aggregate productivity and the gender income gap.

Each of these papers contribute to a better understanding of the processes of resource allocation and structural change, and help in parsing out an important set of underlying forces. Given

the fundamental importance of resource allocation and structural transformation for growth and development, these areas of research, individually and jointly, are open for more work, particularly exploiting the recent methodological approach of combining micro and macro tools.

## References

- Acemoglu, Daron and Veronica Guerrieri**, “Capital deepening and nonbalanced economic growth,” *Journal of political Economy*, 2008, 116 (3), 467–498.
- Adamopoulos, Tasso**, “Spatial integration and agricultural productivity: Quantifying the impact of new roads,” *American Economic Journal: Macroeconomics*, 2024, *Forthcoming*.
- **and Diego Restuccia**, “The Size Distribution of Farms and International Productivity Differences,” *American Economic Review*, 2014, 104 (6), 1667–1697.
- **and –**, “Land reform and productivity: A quantitative analysis with micro data,” *American Economic Journal: Macroeconomics*, 2020, 12 (3), 1–39.
- **, Loren Brandt, Chaoran Chen, Diego Restuccia, and Xiaoyun Wei**, “Land security and mobility frictions,” *The Quarterly Journal of Economics*, 2024, p. qjae010.
- **, – , Jessica Leight, and Diego Restuccia**, “Misallocation, selection, and productivity: A quantitative analysis with panel data from China,” *Econometrica*, 2022, 90 (3), 1261–1282.
- Asher, Sam and Paul Novosad**, “Rural roads and local economic development,” *American economic review*, 2020, 110 (3), 797–823.
- Baily, Martin Neil, Charles Hulten, David Campbell, Timothy Bresnahan, and Richard E Caves**, “Productivity dynamics in manufacturing plants,” *Brookings papers on economic activity. Microeconomics*, 1992, 1992, 187–267.
- Baumol, William J**, “Macroeconomics of unbalanced growth: the anatomy of urban crisis,” *The American economic review*, 1967, pp. 415–426.
- Bento, Pedro and Diego Restuccia**, “Misallocation, establishment size, and productivity,” *American Economic Journal: Macroeconomics*, 2017, 9 (3), 267–303.
- **and –**, “On average establishment size across sectors and countries,” *Journal of Monetary Economics*, 2021, 117, 220–242.

- Boppart, Timo**, “Structural change and the Kaldor facts in a growth model with relative price effects and non-Gorman preferences,” *Econometrica*, 2014, *82* (6), 2167–2196.
- Bryan, Gharad, Shyamal Chowdhury, and Ahmed Mushfiq Mobarak**, “Underinvestment in a profitable technology: The case of seasonal migration in Bangladesh,” *Econometrica*, 2014, *82* (5), 1671–1748.
- Buera, Francisco J, Joseph P Kaboski, and Yongseok Shin**, “Finance and development: A tale of two sectors,” *American economic review*, 2011, *101* (5), 1964–2002.
- Caselli, Francesco**, “Accounting for cross-country income differences,” *Handbook of economic growth*, 2005, *1*, 679–741.
- Comin, Diego, Danial Lashkari, and Martí Mestieri**, “Structural change with long-run income and price effects,” *Econometrica*, 2021, *89* (1), 311–374.
- Duarte, Margarida and Diego Restuccia**, “The role of the structural transformation in aggregate productivity,” *The quarterly journal of economics*, 2010, *125* (1), 129–173.
- Echevarria, Cristina**, “Changes in sectoral composition associated with economic growth,” *International economic review*, 1997, pp. 431–452.
- Foster, Lucia, John Haltiwanger, and Chad Syverson**, “Reallocation, firm turnover, and efficiency: Selection on productivity or profitability?,” *American Economic Review*, 2008, *98* (1), 394–425.
- Gollin, Douglas, David Lagakos, and Michael E Waugh**, “The agricultural productivity gap,” *The Quarterly Journal of Economics*, 2014, *129* (2), 939–993.
- , **Stephen L. Parente, and Richard Rogerson**, “The Role of Agriculture in Development,” *American Economic Review: Papers and Proceedings*, 2002, *92* (2), 160–164.
- Guner, Nezih, Gustavo Ventura, and Yi Xu**, “Macroeconomic implications of size-dependent policies,” *Review of economic Dynamics*, 2008, *11* (4), 721–744.
- Herrendorf, Berthold, Richard Rogerson, and Akos Valentinyi**, “Growth and structural transformation,” *Handbook of economic growth*, 2014, *2*, 855–941.
- Hopenhayn, Hugo A**, “Firms, misallocation, and aggregate productivity: A review,” *Annu. Rev. Econ.*, 2014, *6* (1), 735–770.
- Hopenhayn, Hugo and Richard Rogerson**, “Job turnover and policy evaluation: A general equilibrium analysis,” *Journal of political Economy*, 1993, *101* (5), 915–938.

- Hsieh, Chang-Tai and Peter J. Klenow**, “Misallocation and Manufacturing TFP in China and India,” *Quarterly Journal of Economics*, 2009, *124* (4), 1403–1448.
- Huneus, Federico and Richard Rogerson**, “Heterogeneous paths of industrialization,” *Review of Economic Studies*, 2023, p. rdad066.
- Janvry, Alain De, Kyle Emerick, Marco Gonzalez-Navarro, and Elisabeth Sadoulet**, “Delinking land rights from land use: Certification and migration in Mexico,” *American Economic Review*, 2015, *105* (10), 3125–3149.
- Jones, Charles I**, “The facts of economic growth,” in “Handbook of macroeconomics,” Vol. 2, Elsevier, 2016, pp. 3–69.
- Klenow, Peter J and Andres Rodriguez-Clare**, “The neoclassical revival in growth economics: Has it gone too far?,” *NBER macroeconomics annual*, 1997, *12*, 73–103.
- Kongsamut, Piyabha, Sergio Rebelo, and Danyang Xie**, “Beyond Balanced Growth,” *Review of Economic Studies*, 2001, *68* (4), 869–882.
- Kuznets, Simon**, “Quantitative aspects of the economic growth of nations: II. industrial distribution of national product and labor force,” *Economic development and cultural change*, 1957, *5* (S4), 1–111.
- Lagakos, David and Michael E Waugh**, “Selection, agriculture, and cross-country productivity differences,” *American Economic Review*, 2013, *103* (2), 948–980.
- Midrigan, Virgiliu and Daniel Yi Xu**, “Finance and misallocation: Evidence from plant-level data,” *American economic review*, 2014, *104* (2), 422–458.
- Munshi, Kaivan and Mark Rosenzweig**, “Networks and misallocation: Insurance, migration, and the rural-urban wage gap,” *American Economic Review*, 2016, *106* (01), 46–98.
- Ngai, L Rachel, Christopher A Pissarides, and Jin Wang**, “China’s mobility barriers and employment allocations,” *Journal of the European Economic Association*, 2019, *17* (5), 1617–1653.
- Nguyen, Duc M**, “Heterogeneous Paths of Structural Transformation,” *Available at SSRN 4743025*, 2024.
- Peters, Michael**, “Heterogeneous markups, growth, and endogenous misallocation,” *Econometrica*, 2020, *88* (5), 2037–2073.

**Prescott, Edward C**, “Lawrence R. Klein lecture 1997: Needed: A theory of total factor productivity,” *International economic review*, 1998, pp. 525–551.

**Restuccia, Diego and Richard Rogerson**, “Policy Distortions and Aggregate Productivity with Heterogeneous Establishments,” *Review of Economic Dynamics*, 2008, 11 (4), 707–720.

– **and** –, “Misallocation and productivity,” 2013.

– **and** –, “The causes and costs of misallocation,” *Journal of Economic Perspectives*, 2017, 31 (3), 151–174.

– , **Dennis Tao Yang, and Xiaodong Zhu**, “Agriculture and Aggregate Productivity: A Quantitative Cross-Country Analysis,” *Journal of Monetary Economics*, 2008, 55 (2), 234–250.