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# The role of labor market frictions in structural transformation\*

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## ABSTRACT

Growth is closely related to structural transformation, the reallocation of economic activity among sectors. A well-functioning labor market plays an important role in this process by enabling workers to find employment in the growing, more productive sectors. We review the literature on labor market frictions that limit worker flows, slow structural transformation, and trap workers in poverty. The three main areas of focus are the extent of sectoral wage gaps, labor market dynamics, and evidence on specific frictions. Evidence in each area points to the presence of frictions that hinder worker reallocation. The literature also suggests policies that may help remediate frictions and improve worker mobility. We conclude by noting several open questions that provide promising avenues for future work.

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## Introduction

It has been well-understood since at least Kuznets (1973) that the transition to modern economic growth requires a structural transformation of the economy among sectors, from agriculture to manufacturing and then services. The need for a well-functioning labor market to enable the necessary movement of workers has been recognized for at least as long (Harris & Todaro, 1970; Lewis, 1954). Yet there is a persistent concern among policy makers that developing country labor markets are failing to create the jobs needed to support structural transformation and growth (e.g. World Bank, 2013). Several strands of recent research provide evidence that indeed labor market frictions slow the rate at which workers switch sectors and hence the pace of structural transformation. This paper reviews this research. We discuss evidence on the nature of the underlying frictions, the aggregate consequences of frictions, and policies that may help remediate them. We also highlight profitable avenues for future research.

We start by reviewing the evidence on gaps in labor productivity among sectors. Large sectoral productivity gaps are pervasive, particularly in developing countries. This finding by itself suggests (but does not quite show) that there is a misallocation of labor: moving workers among sectors could raise aggregate output. We then discuss the literature on labor market frictions, dividing it into three main areas.

First, we show that large productivity gaps manifest as large gaps in the outcomes that workers experience, such as wages or consumption. We use a simple Roy (1951) model to frame a discussion

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about whether these gaps reflect opportunities for workers to raise their incomes or selection of heterogeneous workers among sectors. We highlight three approaches the literature has used to address this question. Each approach suggests that at least part of the sectoral consumption and wage gaps are due to labor market frictions.

Second, we review the literature on labor market dynamics in developing countries. Labor market dynamics capture changes in people's labor force status, such as how quickly workers find jobs or how frequently they switch between jobs in different sectors. We start with the evidence on gross labor market flows, such as the job-finding and separation rate. Developing countries have higher rates of labor market flows, but mostly because they have higher flows into and out of self-employment, informal work, and low-earnings wage work. There is no evidence that workers in developing countries are more likely to move into or persist in higher-paying jobs. The fact that workers reallocate more frequently among these short-lived, low-paying jobs suggests that they face frictions to achieving stable, high-wage work.

We then proceed to the literature on the net reallocation of labor among sectors. A consistent finding in this literature is that new cohorts of workers account for a disproportionate share of structural transformation. For example, more than half of the transition from agriculture to non-agriculture is accounted for by new cohorts of workers entering the labor market in non-agricultural jobs while older cohorts of workers retire from agricultural work. The literature typically views this finding as evidence of barriers that prevent older workers from taking advantage of opportunities in growing sectors.

Third, we consider the rich literature that investigates particular frictions that limit the reallocation of labor among sectors. A substantial empirical literature documents the importance of mechanisms such as information frictions, monopsony power of firms, or transportation costs in preventing workers from switching sectors or limiting the gains to doing so. More recently, a number of papers have performed randomized controlled trials focused on labor markets. These papers provide evidence for particular frictions as well as the effectiveness of possible interventions.

We end by discussing two important areas that would benefit from further research. First, on a theoretical front, there is a need to integrate labor market frictions into models of structural transformation. Most of the literature on structural transformation assumes that the reallocation of labor is frictionless and costless, which allows for analytical characterizations that provide clear intuition. However, such models cannot address the growing evidence that frictions impose costs on workers who switch sectors and impede structural transformation. They also include no role for policies that might address these costs.

Second, further evidence is needed particularly on the role of firms in structural transformation. For example, we have little evidence on the importance of firm entry, reallocation, or exit for the process of structural transformation. Evidence of this type may shed further light on the nature of the job ladder in developing countries or on the precise frictions that workers face. It may also suggest useful policies given that firms are responsible for creating the jobs necessary for structural transformation.

## **Do gaps represent opportunities for workers?**

A long literature in development economics has emphasized the existence and importance of gaps in labor productivity between the traditional (rural, agricultural) and modern (urban, industrial) sectors (Kuznets, 1971; Lewis, 1954). Allocating economic activity into the modern sector has been viewed as fundamental for growth for nearly as long (Lewis, 1954; Rosenstein-Rodan, 1943; Rostow, 1960).<sup>1</sup>

Newly available data have made it possible to document differences in labor productivity in a detailed and systematic manner for a large number of sectors and countries. McMillan and Rodrik (2011) draw on data from the Groningen Growth and Development Center database in conjunction

with national data sources to construct labor productivity measures for nine sectors in 38 countries. The gap in average labor productivity between the most and least productive sectors is at least a factor of five in every country in their sample. They also find that sectoral productivity gaps are systematically larger in developing countries.<sup>2</sup>

These gaps suggest that the sectoral allocation of labor is inefficient. More formally, if we take sectoral output prices as given, an efficient allocation of labor requires that the marginal value product of labor – the value of the additional output generated by the last unit of labor in each sector – be equalized among sectors. If it were not, it would be possible to move a unit of labor from a sector with a low marginal value product of labor to one with a high marginal value product of labor and increase the total value of output in the economy. Efficiency thus concerns the marginal value product per unit of labor rather than the average product per worker. Nonetheless, for most widely used production functions, these large gaps in the average product of labor imply large gaps in the marginal product as well (McMillan & Rodrik, 2011).

A large share of the relevant literature has focused on the agricultural productivity gap, which compares labor productivity in agriculture to the remainder of the economy. This focus is motivated by the fact that the typical developing country has a particularly unproductive agricultural sector and yet a high agricultural employment share, often over one-half (Caselli, 2005; Restuccia et al., 2008). Gollin et al. (2014) show that the agricultural productivity gap remains large – a factor of three, among the poorest quartile of countries in their sample – even after providing corrections to or alternative measures of sectoral labor inputs and value added.

While it is important at the aggregate, average labor productivity is not directly relevant to individual workers. They care about their own personal outcomes, including consumption and wages. Several recent studies have shown that non-agricultural workers also enjoy consumption or wages 2–3 times higher than agricultural workers in most developing countries (Gollin et al., 2014; Hamory et al., 2021; Herrendorf et al., 2018). The question we ask in this section is whether these gaps represent opportunities for workers, in the sense that switching from agriculture to non-agriculture would allow them to raise their consumption or wages.

The alternative possibility is that the gaps are attributable to selection of different types of workers into the two sectors. To facilitate this discussion, we use a verbal description of the workhorse model of Roy (1951). Interested readers can find fuller treatments in Lagakos and Waugh (2013) and Lagakos et al. (2020). The model features two sectors, agriculture and non-agriculture, each offering workers a different wage per unit of productivity. Workers are heterogeneous and endowed with different productivities for working in the two sectors. Workers who choose (or switch to) non-agriculture are subject to frictions; we provide numerous examples of what these frictions might be in the fourth section. Each worker chooses to work in the sector that maximizes net-of-friction income.

Even in this simple version of the model, there is no clear interpretation of a gap in average wages between sectors. To understand why, it suffices to focus on two simple examples. In the first example, all workers are identical. In order for these identical workers to be willing to work in both sectors, the non-agricultural sector must offer a wage that is higher than the agricultural sector by just enough to offset the cost of the friction to workers. It follows that the sectoral wage gap reveals the cost of the friction from the worker's perspective in this example. If we could remediate or remove the frictions, workers would switch sectors and earn higher wages.

In the second example, there are no frictions. Workers all have a productivity of one in agriculture, but there is heterogeneous productivity in non-agriculture. Finally, the two sectors offer the same wage per unit of productivity.<sup>3</sup> In this case, workers who have a non-agricultural productivity greater than one choose to work in non-agriculture, while those who have a non-agricultural productivity less than one choose to work in agriculture. This model also has a wage gap, but it is due entirely to how workers select based on their productivities. Forcing any worker to switch sectors would actually lower his or her wage.

In order to make the case that agricultural wage gaps represent opportunities for the productive reallocation of workers, it is necessary to show that they are not explained mostly or entirely by selection. Unfortunately, it is well-known since Heckman and Honoré (1990) that even simple versions of this model are challenging to identify. The essential problem is that we observe the outcomes associated with the choice each worker makes, but not the counterfactual outcomes associated with the foregone choices. The literature has taken three different approaches to address this challenge.

The most common approach uses the changes in outcomes experienced by workers who actually switch sectors. This approach is motivated by the fact that developing countries are experiencing structural transformation (if perhaps too slowly) and there are worker flows among sectors of the economy. If we assume that these workers who are willing to switch are nearly indifferent between the two sectors, then we return to a case similar to our first example above, where the wage gain of switching workers recovers the cost of the frictions from the switching workers' perspectives (Schoellman, 2020). The recent development of panel data sets that track workers over time in developing countries makes it possible to estimate wage gains. Four studies jointly spanning four countries have used panel data to estimate the wage gains for such workers: Hamory et al. (2021) in Indonesia and Kenya; Alvarez (2020) in Brazil; Pulido and Świecki (2019) in Indonesia; and Herrendorf et al. (2018) in the United States. Read as a whole, these papers support three main findings. First, they provide further evidence of cross-sectional gaps in sectoral outcomes: workers in non-agriculture enjoy higher wages and consumption. Second, workers who switch sectors from agriculture to non-agriculture experience improvements in those outcomes, while the smaller set of workers who switch from non-agriculture to agriculture experience deteriorations. Finally, the outcome changes experienced by switchers are typically 20–50% of the total cross-sectional gap.

Viewed through the lens of the simple theory, these findings already suggest that as much as half of the sectoral wage gap reflects distortions that hinder the reallocation of workers between sectors. However, further work is needed. The current literature covers relatively few countries; more extensive analysis would be welcome. Additionally, Lagakos et al. (2020) note that even if we recover an estimate of the frictions for workers who switch, this is not informative about the frictions for workers who do not switch. Both intuition and experimental evidence suggests that these frictions – and the corresponding potential gains – are likely to be larger.

A second approach taken by Gai et al. (2021) is to estimate the Roy model formally. Best practice requires a variable that satisfies the exclusion restriction by shifting sectoral choices without affecting sectoral wages (French & Taber, 2011).<sup>4</sup> For this, the authors take advantage of the rollout of pensions to rural China in a context where grandparents, parents, and children live in close proximity. Pensions (paid to the grandparents) affect parents' willingness to migrate and join the non-agricultural sector by reducing their need to care for the grandparents or the children (who can be cared for by the grandparents). However, they do not affect the parents' sectoral wages directly.

The estimated structural model supports the existence of large frictions to switching sectors, equal to roughly one-half of non-agricultural earnings. This finding is consistent with the conventional wisdom that China has large frictions to migrating and switching sectors, particularly in the form of the hukou policy. The authors also use counterfactual policy simulations to show that the agricultural productivity gap would fall by 60% if hukou policies throughout China were set to the level of the most liberal region. This paper provides valuable evidence in its own right, but it also serves as a 'proof-of-concept' that this approach does indeed capture large frictions in a context where most researchers would expect them to be important. It would be useful to extend this approach to other countries and contexts to get a broader sense of how important frictions are elsewhere.

A final approach developed by Alvarez-Cuadrado et al. (2020) uses the fact that many households in developing countries are simultaneously active in both agriculture and non-agriculture. They propose a model that rationalizes this fact by attributing to these households an intermediate level of comparative advantage. Households with higher agricultural productivity are shown to be

more likely to have an intermediate level of comparative advantage. This finding is interesting because selection is more important in the case where households with higher agricultural productivity have a high level of comparative advantage (Lagakos & Waugh, 2013). Their findings imply that selection may be less important and frictions more important for agricultural productivity gaps, although the authors do not provide an exact decomposition. However, further work is required to show that these household-level findings also apply to individuals, who are the more appropriate unit of analysis when studying productivity and sectoral choice.

To summarize, it is now well-documented that there are large gaps in outcomes for workers employed in different sectors, even after adjusting for observable characteristics. These gaps could represent the effects of labor market frictions that prevent workers from switching sectors, but they could reflect differences in the unobserved productivities of workers who select into the sectors. Disentangling the two is challenging, but the literature has so far utilized three different approaches. Each points to an important role for frictions in driving a wedge between wages in agriculture and non-agriculture.

## How dynamic are labor markets?

A complementary approach looks at labor market dynamics in developing countries. Labor market dynamics capture changes in people's labor force status, such as how quickly workers find jobs or how frequently they switch between jobs in different sectors. The underlying idea is that if labor market frictions are more important in developing countries, this fact should manifest in patterns of how frequently workers switch jobs and sectors, or which types of workers do so.

Donovan et al. (2023) construct comparable measures of gross labor market flows such as the job-finding rate and separation rate for a sample of 49 countries. Their main finding is that flows are two to three times higher in developing countries than in developed countries. However, they also show that these higher flows are driven by flows into, out of, and between self-employment, informal work, and low-earnings wage work. These flows do not help workers climb the job ladder to stable, high-paying jobs.

The fact that workers can flow into and out of these jobs so frequently suggests that poor countries are not characterized by uniformly high labor market frictions that prevent workers from switching between any jobs. However, the fact that workers do flow frequently into and out of these marginal jobs without climbing the job ladder suggests that they face frictions to finding or moving to stable, high-paying wage work.

A second, related literature documents facts about the net reallocation of labor among sectors during the process of structural transformation. These surveys use either repeated cross sections or panels of a representative sample of workers to investigate which workers switch sectors. The results provide further indirect evidence of frictions to labor reallocation.

A key finding is that much of structural transformation is accounted for by new cohorts of workers entering growing sectors while older cohorts of workers retire from shrinking sectors. This finding arises in studies focusing separately on the Korean growth miracle, Argentina, and the United States (Kim & Topel, 1995; Lee & Wolpin, 2006; Pérez, 2018). Recently, Porzio et al. (2022) and Hobijn et al. (2018) take advantage of the widespread availability of harmonized international databases to document the same finding for a large set of countries spanning much of the globe. They find that roughly half of structural transformation can be attributed to entry of new cohorts and exit of retiring cohorts, with the share rising to 60–70% for the transition out of agriculture.

The fact that new cohorts play such a particular role in the process of structural transformation suggests that they find it easier or less costly to enter the growing sectors. This may be because they have more or different skills, or because they are more willing to make investments given that they can amortize the costs over their longer remaining working life. Whatever the reason, the fact that older workers do not switch sectors has costs. Hobijn et al. (2018) use an instrumental variable strategy to show that structural transformation lowers wages in shrinking sectors. They estimate

that a one percentage point decline in a sector's employment share lowers wages for workers in that sector by 1.6–2.9%, with the effect rising to 5.1–5.8% for the oldest workers.

Besides age, education and gender stand out as characteristics that seem to play a role in which workers switch sectors. Educated workers are particularly likely to exit agriculture and particularly likely to enter skill-intensive service sectors (Porzio et al., 2022). Several papers have documented an important role for gender in the form of a link between female labor force participation rates and the rise of the service sector (Buera et al., 2019; Rendall, 2018). To some extent, this appears to reflect the fact that women have a comparative advantage in services, possibly because it is less strength-intensive (Ngai & Petrongolo, 2017; Rendall, 2018). However, some of women's choices are affected by discrimination in schools and in the labor market (Altonji & Blank, 1999; Hsieh et al., 2019). In this case, discrimination both lowers women's wages and slows the pace of structural transformation.

## What frictions prevent reallocation of workers?

The evidence that we have considered so far is indirect. Labor market frictions are inferred from wage gaps and the patterns of worker flows and worker reallocation among sectors. While these approaches provide useful information on the aggregate effect of labor market frictions, they are limited in their ability to speak to what precise features of labor markets act as frictions for workers who want to switch sectors. Thus, they also offer limited guidance to policy makers who wish to remediate such frictions. To make progress on these questions we turn to the complementary literature that investigates specific labor market frictions.

Recall from the second section of this paper that an efficient allocation of labor requires that the marginal value product of labor be equated across sectors. Labor market frictions are factors that reduce the ability or willingness of workers to move jobs and sectors to achieve this allocation. Broadly speaking, there are two mechanisms through which frictions work. First, workers generally do not make decisions based on the marginal value product of labor in a sector; indeed, they probably do not observe or know this marginal value product. Instead, they make decisions based on wages. In a competitive labor market, wages are equal to the marginal value product of labor.<sup>5</sup> One mechanism for labor market frictions is to distort wages from the competitive benchmark. For example, a firm may enjoy a dominant position in a local labor market and use that to pay low wages, which reduces the incentive for workers to switch jobs. The second mechanism is that it may be difficult for workers to switch between jobs even when they observe higher wages elsewhere. For example, higher-paying jobs may be located far from where a worker currently lives. The literature has identified a number of labor market frictions that work through one of those two mechanisms. We review the main ones here.

## Geography

Perhaps the most obvious friction in labor markets is geography. This friction is particularly salient when discussing workers switching sectors: leaving agriculture likely means moving from a farm in a rural area to a factory, store, or office in an urban area. The importance of geographical constraints is a central feature of the related literature on rural-urban migration (Lagakos, 2020). In order to access higher-paying jobs, workers may need to cover substantial distances in countries with weak or missing infrastructure (Brooks & Donovan, 2020; Tsivanidis, 2019). Some countries – most notably China – explicitly restrict spatial movement as well (Ngai et al., 2019; Tombe & Zhu, 2019).

Geography also introduces more subtle constraints. Baseler (2023) shows that rural workers can be poorly informed about relevant job opportunities in urban areas. Moving is also risky, particularly since migrants find it difficult to access the informal, village-based risk-sharing



arrangements that play an important role in many developing countries (Morten, 2019; Munshi & Rosenzweig, 2016). Finally, geography can amplify the effect of other distortions. For example, Foster and Rosenzweig (2022) show that search and travel costs for hired farm laborers combine with imperfect land markets to trap excess workers on unproductive farms in India.

### **Labor market power**

Whereas geography makes workers less able to switch jobs, the remaining frictions we consider work through the channel that firms pay wages that are not equal to the marginal value product of labor. The most obvious case is when firms have labor market power. Empirical evidence on this question comes from estimates of the elasticity of labor supply to the firm, meaning the percentage decline in labor an individual firm would experience if it lowers its wages by one percent. In a world with perfectly competitive labor markets this elasticity should be infinity, because a firm that offers any below-market wage would attract no workers, while a firm that offers any above-market wage would attract them all. Recent work for the United States finds significant evidence for market power, with the estimated elasticity in the range of 4.2–5.8 (Azar et al., 2022; Bassier et al., 2022).

A few papers have extended this type of analysis into developing countries and found yet lower estimates of the elasticity of labor supply to the firm, indicating even more labor market power. Brooks et al. (2020) estimate the elasticity in China and India and find that it ranges from 0.4–2.5. Amodio and de Roux (2021) estimate the elasticity for Colombia to be 2.5. This level of market power has important consequences for wages. Brooks et al. (2020) estimate that market power lowers the labor share by 10 and 15% points in China and India. If these findings are more widespread, then they suggest that pro-competitive policies would be likely to boost wages in productive sectors and hasten the pace of structural transformation.

### **Informality**

A second labor market friction that works through the distorted wage channel is informality, which encompasses a large share of work in developing countries (La Porta & Shleifer, 2014). While early work in the literature treated the formal and informal sectors as segmented markets, subsequent research reveals substantial overlap and transition between these sectors (Maloney, 1999, 2004). In some cases a single firm will have both formal and informal workers (Ulyssea, 2018). Given this, most recent frontier research models informality as a choice that workers and firms make (Albrecht et al., 2009; Almeida & Carneiro, 2012; Bobba et al., 2021; Meghir et al., 2015).

Taxes and regulation are a central margin to these choices: formal jobs are subject to regulation and taxation, whereas informal jobs are not. Taxes and regulations lower the wages that firms pay their workers, all other things equal. They can also benefit workers, for example by mandating job protections or funding social benefits. The key question is whether the direct value of those benefits to a worker is equal to the cost of lower wages. If it is not, then workers will have an incentive to take informal jobs. Since formal jobs are more common in manufacturing and service sectors and less common in agriculture, this implies that informality can act as a friction to the sectoral reallocation of labor.

Amodio et al. (2022) provide evidence that there are also important spillovers between the market power of formal-sector firms and the size of the informal sector as well as wages paid there, suggesting important linkages between these two theories that merit further exploration. Recent work by Bobba et al. (2021) also suggests that informality depresses human capital formation, which implies that the presence of a large informal sector may have important dynamic implications as well.

## ***Efficiency wages***

A final strand of the literature that works through the wage margin is efficiency wage theories. Broadly, efficiency wage theories allow a worker's productivity to be a function of their wage. Employers internalize this fact and offer higher wages to induce higher productivity, even if other applicants offer to do the same job for lower pay (Katz, 1986). The fact that firms pay higher wages leads them to hire fewer workers; workers who seek the higher-paying jobs are rationed, possibly through queueing.

One classic variant of these theories that has received much attention in development economics posits that workers' productivity depends on their caloric intake (Strauss, 1986). If, for example, non-agricultural firms are more likely to pay efficiency wages, this could help rationalize why non-agricultural wages are higher but workers do not switch sectors. More recently, Hjort et al. (2022) posit that efficiency wages may help explain the high price of high-quality management in developing countries. They find that this high price deters the adoption and spread of modern business enterprises. Such firms are more important in non-agriculture, suggesting a second channel through which efficiency wages might slow structural transformation.

## ***Human capital***

The final factor we consider is human capital. Human capital itself does not constitute a labor market friction. However, growing research suggests that it interacts with labor market frictions in two important ways. First, there is growing evidence that labor market frictions reduce the incentives to invest in human capital. Frictions to finding jobs reduce the returns to investing in education (Bobba et al., 2021; Flinn & Mullins, 2015). Frictions to switching between jobs reduce the return to workers investing in their own skills while working (Engbom, 2022). Frictions to retaining workers reduce the incentives for firms to train their labor force (Guner & Ruggieri, 2022; Ma et al., 2023). These results suggest that reducing labor market frictions is likely to lead workers to increase human capital accumulation along a number of margins.

Increasing human capital is in turn likely to generate structural transformation. Porzio et al. (2022) provide well-identified causal evidence for the case of the structural transformation out of agriculture. Specifically, they show that cohorts who benefit from expansions of education are substantially less likely to choose agricultural employment. A key mechanism is likely that the sectors that grow during structural transformation are generally more education-intensive and offer workers higher returns to their schooling (Buera et al., 2022; Herrendorf et al., 2018). Increasing training may have similar effects since the returns to experience are also higher in non-agriculture than in agriculture (Herrendorf et al., 2018).

The second well-documented interaction between human capital and labor market frictions emphasizes information frictions. In addition to acquiring skills, workers also need to know and be able to demonstrate their value to employers. A recent literature provides evidence that imperfect information is a key obstacle and that providing information generates more matches that are also more stable. Abebe et al. (2021) find that allowing workers to signal skills more easily in urban Ethiopia increases employment and earnings four years later. Similarly, Bassi and Nansamba (2022) show that revealing worker 'soft' skills (communication ability, trustworthiness) to both the worker and potential firms in Uganda leads to better sorting. Carranza et al. (2022) experimentally manipulate both workers' knowledge of their own skills and firms' signals of those skills and show that each margin is important for matching. Finally, imperfect information also helps explain the large and persistent role for referrals in labor markets (Beaman & Magruder, 2012). These findings suggest that, for example, certification programs that allow workers to provide evidence of their relevant knowledge or skills to employers might boost the incentives to acquire human capital and accelerate structural transformation.

## Open questions and directions for future work

The literature discussed in previous sections highlights three critical and complementary points. First, there exist wage and consumption gaps that do (at least in part) reflect opportunities for workers and for policy-makers. Second, labor market dynamics in developing countries point to frictions that prevent workers, particularly older ones, from finding stable, high-wage jobs in growing sectors. Third, we have evidence of several specific labor market frictions that slow the reallocation of workers among sectors.

An important next step for this literature is to develop models of sectoral labor reallocation and structural transformation that incorporate labor market frictions. In most of the classic work on structural transformation labor is assumed to be homogeneous and fully mobile across sectors. Structural transformation is thus both efficient and costless. These models permit elegant analytical solutions and provide clear intuition for how structural transformation can arise in response to changing technologies or non-homothetic preferences. However, they need to be amended to permit meaningful discussion of the role of labor market frictions or to allow a possible role for policy.

Models that incorporate labor market frictions are challenging to construct. At the aggregate level, structural transformation is, by definition, unbalanced, in the sense that the relative size of the sectors changes continuously. In order to integrate frictional labor markets, new analytical techniques or computational methods that allow for unbalanced growth are necessary. Recent work by Buera et al. (2020) provides a new way to characterize the evolution of structural transformation models that helps ease this burden.

A small set of existing papers provide models with structural transformation and frictions that may be useful building blocks. One potentially useful addition in this vein is Feng et al. (2023). They construct a model in which higher unemployment is induced by skill-biased structural change, which causes more search (and thus more failure) for the lucrative jobs in skill-biased sectors. A second is Caselli and Coleman (2001), who analyze the U.S. structural transformation from agriculture to non-agriculture using a model where switching sectors requires workers to pay a cost. This deviation is simple enough that the model still permits analytical solutions. However, the stylized, one-way friction does not yet give much scope for policy analysis.

Three recent papers have developed models with richer frictions in the spirit of Caselli and Coleman (2001). In each, workers make joint human capital investments and sector or occupation choices in an environment with changing technologies. Each also permits analytical solutions. Porzio et al. (2022) explicitly model the role of human capital investment for the transition out of agriculture. The paper's focus is on understanding the role of time versus cohort effects for the reallocation of labor, but the model may be suitable for further analysis. Adão et al. (2022) and Dvorkin and Monge-Naranjo (2019) provide models of workers facing a technological transition generated by cognitive-biased or task-biased technical change. Although these papers are not formulated as models of structural transformation, it may be possible to re-interpret or extend them for this purpose.

Finally, Hobijn et al. (2018) formulate a model of structural transformation with frictions to entering or switching between sectors that is amenable to computational analysis. The key is to frame each worker's sectoral choices as part of a dynamic discrete choice problem, which permits the use of tools from a well-developed literature from labor economics.

It is noteworthy that in all of these papers the underlying friction is related to human capital investment. While Porzio et al. (2022) provide evidence that human capital plays a role in the process of structural transformation, this commonality likely reflects more that this literature is in its infancy. Future work would benefit greatly from incorporating a broader range of the frictions from the fourth section into models of structural transformation. Another important area for future research is to improve our understanding of the role that firms play in structural transformation. Most empirical work focuses on the factors

that lead workers to reallocate across sectors. It would be useful to develop parallel results for firms. For example, it would be valuable to characterize the extent to which the reallocation of jobs across sectors is explained by entry and exit of firms, net reallocation of jobs among existing firms, and firms themselves switching sectors. Likewise, it would be valuable to consider models of structural transformation that allow for frictions to starting or expanding firms in growing sectors and showing the effects of such frictions for the pace of structural transformation and for labor market opportunities of workers. For example, it is common for policy makers to link the large informal economy in developing countries to a failure of firms to create good jobs (World Bank, 2013). We have little evidence on whether this is the case and no models that evaluate whether such forces might play a role in structural transformation.

## Conclusion

Growth requires a structural transformation of the economy among sectors. The role of labor markets is to enable the movement of workers and jobs from shrinking and less productive to growing and more productive sectors. This paper reviews three forms of evidence that all support the existence of sizable labor market frictions in developing countries. These frictions trap workers in low-wage work, exacerbating poverty. They also slow structural transformation and growth for the entire economy.

Although this literature has recently made substantial progress, there are several fruitful areas for future research. Integrating the evidence on the specific nature and extent of frictions into existing models of structural transformation offers the potential for serious policy analysis and evaluation of the aggregate gains from removing frictions. New evidence on the role firms play in the process of structural transformation would be a welcome complement to a literature that is mostly focused on workers so far. This requires both new data and new theory, but with the potential for important gains both in our understanding of structural transformation.

## Notes

- 1 We focus specifically on the reallocation among sectors, but a related literature documents similar facts about reallocation between rural and urban regions; see Lagakos (2020) for an overview
- 2 The coefficient of variation of log sectoral labor productivity is more than twice as large for the poorest as compared to the richest countries. Interested readers may want to consult Herrendorf et al. (2022) for new data on sectoral labor productivity covering more countries. See also Duarte and Restuccia (2010) on labor productivity differences or Herrendorf and Valentini (2012) on total factor productivity differences.
- 3 Formally, this follows if the two sectors have linear production functions with equal productivity and the outputs are perfect substitutes.
- 4 An alternative would be to use experimental evidence to discipline the model, as Lagakos et al. (2023) do for a similar model of rural-urban migration. We are aware of no papers that have pursued this path to disentangling selection and sectoral wage gaps.
- 5 If wages were lower, then firms could increase their profits by hiring an extra worker, since the wage they pay the worker is less than the value of the extra output the worker produces. If wages were higher, then firms could increase their profits by firing a worker by similar logic.

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