



## Structural Model Analysis of The Relationship Between Cross-National Trade, Use of Technology and Labor Costs

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### Abstract

This research aims to quantify the costs of job mobility, emphasizing the differences in costs faced by workers with different qualifications. Our analysis uses the Ordinary Least Squares and Instrumental Variables. The impact of trade and technological reforms on workers' welfare is largely dependent on the level of economic flexibility. In this context, high labor mobility costs become an important factor in analyzing the impact of trade policies. Despite workers' high mobility between job sectors, traditional theory suggests that this flexibility may not be as strong due to the greater influence of non-financial factors. This suggests that there needs to be a different policy approach to managing the impact of trade and technology reforms to ensure worker well-being and overall economic stability. Trade and technology reforms often result in increased efficiency, but they also incur certain costs. The finding that unskilled workers have higher mobility costs than semi-skilled workers is interesting, as it suggests that there are greater barriers for unskilled workers to move between employment sectors. The impact of slow adjustments in the labor market due to high mobility costs is also important, as this indicates that the economy takes a long time to adapt to changes, both from trade and technological reforms. This has long-term implications for the well-being of negatively affected workers, depending on the particular model parameters. It is important to continue to deepen our understanding of the costs of mobility and labor market adjustment, as this will help in designing better policies to support workers impacted by economic reform and change.

**Keywords:** Employment, Technology, Efficiency, Trade.

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### 1. Introduction

The study and quantification of the costs of adjustment in the economy is important for broadening our understanding of the gains or losses to society as a whole, as well as their impact on the welfare of groups of workers particularly affected by adjustment. With a deeper understanding of the modifications caused by these processes, we can identify ways to manage resource reallocation efficiently and equitably [1]. This could include developing policies that take into account fair compensation for affected groups, skills development for affected workers, as well as investment in innovation and new technologies that can increase the productivity and competitiveness of the economy as a whole. Thus, a thorough understanding of the resource reallocation process can have a significant positive impact on the economy as a whole. Starting with a model in which workers face the costs of moving between job sectors, we will examine the potential impact of trade and technology shocks on the sectoral allocation of jobs, wages, and worker welfare [2]. We will discuss the structural model of employment reallocation, which follows the approach of previous research. They present a stochastic model that adapts to any number of employment sectors and geographic regions. On the other hand, it also presents a simplified model that only considers two activity sectors. They study the extended analytical development of steady-state properties and adjustment pathways in the context of these models. Using this model, we hope to evaluate in more depth how trade and technology shocks can affect various aspects of the sectoral allocation of jobs, including wages and worker welfare. In doing so, this paper will make an important contribution to our understanding of labor market dynamics and their implications for relevant economic policies [3].

The study's first goal is to quantify the costs of job mobility, focusing on the differences in costs faced by workers with different qualifications, in different time periods, and in different regions of the country. In addition, we will estimate entry costs according to different economic sectors. From an economic policy perspective, estimates of mobility costs that are characteristic of certain groups of workers have great relevance [4]. By being able to quantify the private costs borne by individuals as a result of, for example, trade shocks, this can help consider the political feasibility of such reforms as well as the compensation required to mitigate resistance from disadvantaged groups. In this case, mitigating the negative impact of trade integration on

disadvantaged groups is an important task for the government. We hope this research will enhance our understanding of the costs associated with job mobility, paving the way for more effective and sustainable policies in the face of economic and technological change [5].

This context assumes that workers have rational expectations and have the ability to transition from their current job sector to a different one over time. However, to do this, they have to bear the costs. These costs consist of general components that remain constant over time or between workers, and specific components that change over time and can be negative [6]. This specific cost component allows us to include non-economic factors as a major part of job mobility decisions. Thus, in our analysis, we will consider how non-economic factors, such as individual preferences, social and environmental conditions, and other factors, may influence workers' decisions to change job sectors. This is important to understand in a policy context, as considering these factors can help design policies that are more effective in responding to political or technological changes that affect the sectoral allocation of jobs [7].

This study employs an ex-ante analysis to assess the potential impact of trade liberalization policies and technological change on sectoral labor allocation, sectoral wages, and worker welfare [8]. To achieve this goal, we will conduct a simulation exercise that includes structural parameters related to worker mobility costs, which we will estimate in advance as a central part of our model [9]. We will analyze the impact of trade and technology shocks in a dynamic context, taking into account their impact on workers' intertemporal utility. Thus, this research will provide a deeper understanding of how trade policies and technological change can affect the labor sector, wages, and overall worker welfare [10]. The analysis will consider the intricate dynamics of these factors in the context of economic and technological change, establishing a robust foundation for crafting effective policies to address the labor market's challenges. There are two main approaches that describe the dynamics of the allocation of sectoral factors in response to shocks [11]. First, the net flow approach assumes the existence of mobility costs for the factors, where the factors move gradually and in one direction [12]. Second, the search model approach demonstrates how the shock exogenously separates workers from the firm, forcing them to seek new employment in order to resume productivity. The theoretical approach combines the characteristics of both types of models. They combine an equilibrium model that includes mobility costs with greater intersectoral gross labor flows compared to net flows, suggesting that workers move across sectors in response to such shocks [13]. By combining these two approaches, these models can provide a more holistic understanding of how the allocation of sectoral factors changes in the face of economic and technological change. It provides a strong foundation for analyzing policy impacts and understanding labor market dynamics in a broader context.

## **2. Research Methods**

Our analysis limits the database to male workers in the employee or worker categories. Our initial step is to calculate the gross flow of workers between sectors using survey data. Next, we estimate average wages by sector and period by averaging each individual's main job wages. We then adjust these wages for the consumer price index and normalize them to ensure the average salary in the sample equals one. To carry out the simulation exercise, we will use data on the share of each sector's products in total product and the share of labor in revenue generation, which we will calibrate as needed. Through this approach, we aim to understand the impact of trade liberalization policies and technological change on labor allocation, wages, and worker welfare in more detail and realistically. Our analysis uses the ordinary least squares and instrumental variables methods to support the validity of the results obtained.

## **3. Results and Discussion**

In developing the analysis, the first step we took was to calculate the average cost of employment sector change for all individuals in our database. We interpret parameter  $C$  as the average cost of transitioning between job sectors, which is associated with the average semiannual salary. Next, we transform the estimated values to estimate the variance of idiosyncratic shocks. In this way, higher variance values will reflect greater mobility between employment sectors while also taking into account other factors that influence sector change dynamics. This approach gives us a better understanding of the costs of employment sector changes and their impact on workers within our analytical framework. In this way, we can develop more effective and sustainable policy strategies to overcome challenges in labor allocation and improve worker welfare.

According to the instrumental variables method, the cost of moving between job sectors is approximately 15 times the average semiannual salary. However, these costs rise to about 20 times the average semi-annual salary. Estimates of expected future returns influence the decision to move between job sectors. The expected benefits of changing jobs must exceed the current switching costs for workers to decide to change job sectors. When we examine different sub-periods, we see that the costs of moving between job sectors vary. This variation suggests that the costs of moving between job sectors may change over time, which is important to consider in policy analysis. Our study's high estimate of employment adjustment costs is consistent with previous findings, which found a  $C$  value of 7.6, considering a discount factor of 0.9. These findings suggest that the costs of labor

mobility can indeed be very high, especially when compared with workers' salaries. This shows the importance of taking employment adjustment costs into account in the analysis of employment policy and the economy in general. In this context, it is important to consider the various factors that can influence labor mobility decisions, as well as their impact on workers' well-being and labor market efficiency.

In developing the analysis, we were interested in estimating differences in mobility costs between employment sectors based on workers' educational qualification levels. We define three educational categories such as skilled workers, semi-skilled workers, and unskilled labor. Due to the limited number of observations, we can only recover parameters relating to semi-skilled and unskilled workers. The results of the analysis show the main results of estimating the cost of mobility between job sectors based on the level of educational qualifications. This analysis provides a deeper understanding of how labor mobility policies can have different impacts depending on workers' qualification levels. This explanation enriches our insight into designing more appropriate and effective policies to increase labor mobility and economic growth.

Our analysis shows that the mobility costs faced by unskilled workers, when measured in comparison with their average semi-annual wages, are much higher than the costs faced by semi-skilled workers. Using instrumental variable methods, we find that the average mobility costs for unskilled workers are approximately 17 times their average semiannual wages. On the other hand, the average mobility costs for semi-skilled workers is 7.6 times their average semi-annual wages. However, when we calculate the cost differences adjusted for wage differences between unskilled and semi-skilled workers, we find that in monetary terms, the costs faced by unskilled workers are between 70% and 95% higher than those faced by semi-skilled workers. These findings support the possibility of a segmented labor market where more educated workers are expected to face greater increases in job mobility, especially in terms of wages. This analysis provides important insights into labor market dynamics and can provide a strong basis for developing more inclusive and sustainable policies to improve labor mobility.

To estimate the costs of labor mobility between sectors in various regions, regional clustering is an important approach to overcome data limitations. Although ideally we would like to see costs separately for each province, in reality, this is not always possible due to limited data availability. Therefore, we can use groupings of regions based on similar characteristics, such as economic, demographic, or geographic conditions, to develop broader estimates. This approach allows us to obtain more relevant and detailed information about mobility costs in different regions without having to rely on data specific to each province. While this may not provide the exact same picture as a more disaggregated approach, it can provide valuable insight into the costs of labor mobility at a regional level. Our analysis reveals that estimates of labor mobility costs between sectors are not significantly different from estimates for other regions. Despite the assumption of increased economic agglomeration in these regions, no evidence indicates a direct reduction in worker mobility costs across sectors. The relatively uniform differences in mobility costs between sectors across countries suggest that factors other than economic agglomeration, such as industrial structure, employment policies, and labor market conditions, may have a significant influence on mobility costs. This demonstrates the importance of considering various factors in the analysis of the costs of mobility between sectors in order to gain a more holistic understanding of a country's employment dynamics.

Our analysis takes other potential sources of bias into account, as discussed in related literature. First, the calculation of wages for each industry in the sample, based on the industry's average wage, carries the potential for error. Significant sampling errors can cause industry wage measurements to be imperfect, resulting in a bias in the wage variable. Second, wage differences between sectors may reflect different worker characteristics, not just high mobility costs. To test for biases related to sectoral employee composition, we use procedures suggested by previous research. Cross-sector wage regressions with industry fixed effects and fixed effect estimates are used to run the regressions. This takes away the effect of the composition of the sectors. However, the results do not show any significant bias regarding the sectoral composition of workers. Finally, the assumption that workers are risk-neutral may introduce bias in the estimates. If we consider that there are risk-averse individuals, the response to wage differences between sectors may be lower than estimated. In this scenario, we propose that the cost of worker mobility should incorporate components, which encompasses factors like job training, and an element that signifies the portion of the decision to move between sectors that solely pertains to risk avoidance.

An analysis of entry costs between sectors that shows similarities with previous research provides a deeper understanding of the economic dynamics between sectors. The similarity of these findings suggests the existence of relatively stable patterns in entry costs, which can provide a broader view of the factors influencing the economy across contexts. However, it is important to remember that different economic contexts across countries or time periods can result in different patterns of entry costs between sectors. Therefore, further research that considers these contextual factors could provide more comprehensive insights into entry cost patterns across sectors. This analysis can also be a good basis for further research on the factors underlying entry cost patterns between sectors. This ongoing research can help identify economic policies that are more effective in managing entry costs between sectors and promoting sustainable and inclusive economic growth. The simulation exercise assumes exogenous domestic price determination, meaning that factors outside the model

determine domestic prices and do not influence them. This may limit the model's ability to estimate the impact of changes in domestic prices caused by factors internal to the model, such as changes in labor allocation between sectors. Furthermore, the fixed capital assumption can restrict the model's ability to estimate the impact of changes in capital investment on labor allocation and goods prices. Noting, however, that previous studies have found that this assumption does not significantly influence their research results regarding the dynamics of job allocation, wages, and utilities. However, it is important to remember that different economic contexts, such as small and open economies, can produce different distortions in research results. In future research, assessing the impact of modal adjustments on the dynamic evolution of models could be a central topic of interest. By considering existing limitations and assumptions, this research can provide deeper insight into economic dynamics and labor allocation in the context of small and open economies.

In this context, the economy begins in a stationary state, with actors anticipating the permanent maintenance of the existing 20% industrial sector tariff. A government announcement, following the inter-sector mobility decision, represented the sudden liberalization policy, stipulating the permanent elimination of tariffs. The individual discount factor is assumed to be 0.9. The average cost of mobility between sectors will be equal to 16.1, while the parameter determining the variance of special shocks will be equal to 5.5. Thus, with this assumption, the economy will experience significant changes with sudden trade liberalization, which could impact the allocation of labor and prices of goods in various sectors. We can conduct further evaluation to fully understand the impact of this liberalization policy on overall economic welfare. These changes can affect income distribution, economic growth rates, and overall economic stability. Further studies could also explore the impact of these policies on specific sectors and how governments can respond to these changes to improve the welfare of society as a whole.

The results of the analysis show that the adjustment path of employment allocation is sectoral, which shows how changes in trade policy affect the movement of workers between sectors. When a trade shock is detrimental to the manufacturing sector, workers with low mobility costs tend to immediately leave that sector to look for work in other, more stable sectors. Meanwhile, workers with high mobility costs are more likely to stay in the manufacturing sector or wait to see the evolution of the situation before deciding to move. It goes on to describe changes in real wages in response to trade policy changes. When trade shocks occur that are detrimental to the manufacturing sector, real wages in that sector tend to decline due to increased competition and decreased demand for labor. On the other hand, other sectors that may experience an increase in demand for labor may experience an increase in real wages due to increased competition for labor. Both demonstrate that changes in trade policy not only affect the allocation of employment between sectors, but also have a direct impact on real wages and worker welfare. These effects may continue over a period of time as part of the economy's adjustment to changing trading conditions.

In the new steady state following trade reform, there is a significant change in the value of options to change future employment sectors for workers in the manufacturing sector. Trade reform caused an increase in wages in the non-manufacturing sector, which in turn led to a weakening of the manufacturing sector's value function. In the short term, there was an overreaction to the sudden fall in manufactured goods prices. The non-profit manufacturing sector experienced an increase in real wages and value functions, while the non-manufacturing sector saw a decline. The labor market's rapid adjustment to changes in prices and demand explains these changes. However, in the medium run, as more workers enter non-manufacturing sectors, the increase in labor supply in those sectors leads to a decrease in equilibrium wages. This reflects a medium-term adjustment process to structural changes in the economy caused by trade reforms. This analysis shows that trade reforms can have complex and diverse impacts on labor markets in the short and medium term. Over time, these effects may become more stable as labor markets and the economy as a whole adapt to new conditions.

In the new stable state after trade liberalization, the intertemporal utility of workers in negatively affected sectors may vary, depending on the configuration of the model parameters. It is possible that, despite receiving lower wages, workers in this sector may have greater utility in the final stable state. An increase in real wages in other sectors and the option for workers to switch job sectors in the new economic balance cause this phenomenon. Factors such as the discount factor of the affected agents and employment adjustment costs influence the probability that workers will have greater utility when a trade shock occurs. The larger the discount factor and the lower the adjustment costs, the more likely it is that workers will choose to change job sectors in the future, giving greater relative weight to that choice than to wage reductions in their own sector. The traditional approach of only estimating wage declines in import-competitive sectors does not reflect their impact on the value of the option to change employment sectors. Therefore, this study proposes a more holistic approach that could enhance our understanding of how trade reforms affect workers' utilities across various sectors.

A drastic increase in real wages in the industrial sector as a result of technological progress could result in a gradual reallocation of workers from the non-manufacturing sector to the manufacturing sector. This is due to the attractiveness of higher salaries in the industrial sector, which is experiencing increased productivity. As a result, there has been a gradual increase in wages in the non-manufacturing sector in response to the need for workers to leave the sector. On the other hand, wages in industrial sectors experiencing technological progress may

experience a decline due to increased production efficiency, which allows reductions in production costs, including labor costs. In the context of simulating the impact of trade liberalization, the reallocation of employment between sectors can also affect real wages in the non-manufacturing sector. An increase in labor supply in the non-manufacturing sector as a result of reallocation can cause a decrease in equilibrium wages in that sector. A fall in the price index, potentially resulting from tighter competition due to trade liberalization, amplifies this effect. Overall, increases in real wages in the industrial sector due to technological advances can have complex impacts on the employment and wage structure in various economic sectors. These changes can reflect complex market dynamics and structural changes in the economy.

In the new steady state, after the adjustment process, there is an increase in wages and intertemporal utility expectations in all sectors of the economy. However, the employment structure between sectors has changed, with expansion in the industrial sector and a trend towards increasing attractiveness in other sectors. Changes in the value of the option to switch employment sectors cause the increase in value for workers in the industrial sector to be relatively smaller than the increase in real wages. In the new balance, real wages in the industrial sector increased by 20% compared to initial stable conditions, while employment participation in the industrial sector increased by 30%. Thus, the new steady state after the adjustment process shows significant changes in the employment structure and real wages in various economic sectors. Increased employment participation and increased attractiveness in the industrial sector indicate structural changes in the economy that can influence overall economic growth and distribution.

#### 4. Conclusion

The impact of trade and technological reforms on workers' welfare is largely dependent on the level of economic flexibility. The structural characteristics of the labor market are consistent with the low levels of flexibility recorded in other developing countries. This suggests that there needs to be a different policy approach to managing the impact of trade and technology reforms to ensure worker well-being and overall economic stability. Trade and technology reforms often result in increased efficiency, but they also incur certain costs. In this context, the concept of winners and losers is extremely relevant because the impact of reforms can vary depending on the position and characteristics of individuals or groups in the economy. However, the literature on this method rarely discusses this question in depth. To identify the gainers and losers from this dynamic process, it is necessary to estimate the costs of mobility for different groups of workers. Thus, an analysis of mobility costs can provide a better insight into how trade and technology reforms affect different groups in the economy and help design better policies to manage the impact of such changes. The finding that unskilled workers have higher mobility costs than semi-skilled workers is interesting, as it suggests that there are greater barriers for unskilled workers to move between employment sectors. This, along with similar sectoral structures, suggests that labor mobility patterns are relatively consistent across countries. The impact of slow adjustments in the labor market due to high mobility costs is also important, as this indicates that the economy takes a long time to adapt to changes, both from trade and technological reforms. This has long-term implications for the well-being of negatively affected workers, depending on the particular model parameters. It is important to continue to deepen our understanding of the costs of mobility and labor market adjustment, as this will help in designing better policies to support workers impacted by economic reform and change.

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