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On the heterogeneous effect of trade on unemployment

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Abstract

This paper tests a series of predictions about the possible relationship between trade and unemployment. Empirical results show that trade reduces unemployment in countries with comparative advantage in sectors with more efficient labour markets and leads to higher unemployment in countries with comparative advantage in sectors with less efficient labour markets. These results are obtained in a panel dataset of 107 countries covering the period 1995-2009. They further help reconcile the apparently contradicting evidence in the empirical literature and contrasting political views on the impact of trade on unemployment.

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Contents

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1. Introduction

Does international trade create or destroy jobs? Theoretical insights from Carrère et al. (2014)[1] suggest that patterns of trade and sector-specific labour market frictions interact in shaping aggregate unemployment. More precisely, if a country has a comparative advantage in sectors that have less efficient labour markets, then trade reallocates resources towards these sectors, and thereby may increase aggregate unemployment. Conversely, if comparative advantage and sector-specific labour market efficiency are positively correlated, unemployment falls with trade. This paper develops an empirical strategy aiming at testing this theoretical prediction. We find strong empirical support for the latter in a panel of 107 countries that account for more than 95 percent of world trade over the period 1995-2009.

Integrating labour market frictions in trade models as in Carrère et al. (2014) is important for at least three reasons. First, such a setting allows trade to destroy or create jobs, rather than assume away the impact of trade on unemployment. Until fairly recently, most economists would agree with Krugman (1992) that "it should be possible to emphasize to students that the level of employment is a macroeconomic issue...with microeconomic policies like tariffs having little net effect." Most international economics textbooks have no chapter on the impact of trade on unemployment. Our paper contributes to the filling of this gap. Second, the net impact of trade on unemployment is likely to be complex and ambiguous as illustrated in Helpman and Itskhoki (2010). It is therefore important to understand when to expect the adverse effects to dominate. Our paper provides an empirical test of the sector reallocation effect, a theoretical prediction we obtain building on Helpman and Itskhoki (2010) and Dornbusch, Fisher, and Samuelson (1977). Third, the relationship between trade and unemployment is an important political issue. Policymakers are convinced that there is a link between the two, but they disagree on the direction to which unemployment moves with trade. Voters seem to be convinced about this link, too, as voting patterns in the recent us presidential election suggest (Autor, Dorn, Hanson, and Majilesi, 2016). Our model and empirical evidence claim that the answer depends on the correlation between patterns of trade and labour market frictions.

Bringing Carrère et al. (2014) theoretical predictions to the data requires three steps. First, we need a measure of comparative advantage and a measure of sectoral labour market efficiency. We measure the former using the fixed-effect gravity approached introduced by Costinot, Donaldson and Komunjer (2012) and developed further by Hanson, Lind, and Muendler (2015). We construct the latter building on the simple idea that observed country-level unemployment rates are a weighted-sum of sector-level unemployment rates, where weights are given by labour force shares in each sector. Using data on aggregate unemployment and employment by sector we are then able to estimate sector-specific unemployment rates. Owing to the lack of time coverage in the sector level employment data that is available, we further assume that these sector-specific unemployment rates are common across countries in our baseline estimation.[2] We show that this new measure of sector-specific labour market frictions is positively correlated with existing proxies of labour market frictions such as labour union coverage. In a second step, we compute country-specific correlations between measures of comparative advantage and sector-specific unemployment rates. The country with the highest average correlation in our sample is the Russian Federation, which therefore has a comparative advantage in sectors with more inefficient labour markets. The country with the lowest average negative correlation is Israel, which therefore has a comparative advantage in sectors with more efficient labour markets.

Our third and final step involves testing whether unemployment is lower in countries where the correlation between comparative advantage and sector level labour market efficiency is high. The empirical results confirm this theoretical prediction. Robustness checks addressing measurement error and endogeneity of our measure of correlation to aggregate unemployment provide evidence that our results are robust.

[1] They develop a model that introduces search and matching labour market frictions in a trade model with a continuum of sectors to address this question. Comparative advantage drives the patterns of trade, whereas labour market frictions generate equilibrium unemployment. In our model, labour market frictions are sector-specific and the aggregate unemployment rate of a country can be thought of as a weighted average of these sector-specific labour market frictions.

[2] Note that, unlike in Cuñat and Melitz (2012), this identifying assumption implies that sector specific labour market frictions cannot be a source of comparative advantage. The model is general insofar as we do not impose this assumption in the theory, and we show that the qualitative theoretical predictions are identical. In the robustness checks sub-section we provide evidence suggesting that our results are not sensitive to this assumption.

The rest of the paper is organized as follow. Next section briefly discusses the main contributions to the literature on trade and (un)employment with a precise reference to the originality of Carrère et al. (2014) set up and predictions. Section 3 describes the empirical strategy followed to test these predictions. Section 4 presents our core results and a series of robustness checks. Last session briefly discusses the practical relevance of our empirical evidence.

2. Trade and (un)employment: theoretical insights and empirical evidence

This paper builds on a growing literature on the impact of trade on unemployment. This literature has abandoned the assumption that workers displaced by trade reform are simply reallocated to new productive activities. However, whether equilibrium unemployment rises or falls because of trade reform remains an open question.

2.1 Trade and unemployment: theory

Theory provides contradicting answers as discussed in Helpman, Itskhoki, Muendler and Redding (2013). In an early contribution, Brecher (1974) develops a model of a small open economy with a minimum wage to show that the impact of trade liberalization on welfare and unemployment depends on relative factor endowments: labour-abundant countries experience a fall in unemployment as they open up to trade, whereas capital-abundant countries see unemployment increase. Davis (1998), building on Brecher's setup and allowing for terms-of-trade effects in a world with two identical economies except for their labour market rigidities, shows that openness reduces welfare and increases unemployment in the economy with more rigid labour markets. Davidson, Martin and Matusz (1999) assume that sectoral labour market frictions can be a source of comparative advantage and differences across sectors eventually manifest themselves as Ricardian technology differences. In this framework, they show that the impact of trade liberalization on unemployment depends on relative capital-labour endowments across different countries as in Brecher (1974). More precisely, when a relatively capital-abundant large country begins to trade with a small, relatively labour-abundant country, unemployed workers in the large country unambiguously suffer welfare losses even if the small country has a less efficient labour market. Cuñat and Melitz (2012) also recognize that labour market frictions can play an important role in framing comparative advantage patterns. However, they highlight a different mechanism, exploring how differences in the volatility of industries (defined as the variance of firm-level shocks) affect the reallocation of workers across firms within an industry. Their findings suggests that firms in countries with greater labour market flexibility are better able to respond to firm-specific shocks by hiring and firing workers, which gives countries with more flexible labour market institutions a comparative advantage in more volatile industries. Nevertheless the relationship between unemployment and trade liberalization is not explicitly modeled. Helpman and Itskhoki (2010) build a Diamond-Mortensen-Pisarrides (henceforth DMP) model of labour market frictions in a two-sector `new trade' model; a competitive sector produces a homogeneous good and a monopolistically competitive sector produces a differentiated good. They show that a country with relatively low frictions in the differentiated-good sector will be a net exporter of that good. Intuitively, lower frictions imply lower labour costs and, coupled with the `Home-Market' effect a-la Krugman (1980), create a comparative advantage in the differentiated sector. The impact of trade on unemployment is ambiguous, with unemployment raising or falling in both or one country being possible depending on the extent of labour frictions in the differentiated sector relative to the homogenous-good sector.

2.2 Trade and unemployment: empirical evidence

When theory provides contradicting answers, the natural next step is to look for patterns in the data. However, the rapidly growing empirical literature has not found an unambiguous unemployment response to trade liberalization either. Several important papers suggest that trade liberalization or import growth have led to an

increase in unemployment. Revenga (1994) provides evidence in this direction for Mexico's manufacturing, Harrison and Revenga (1998) for Czechia, Poland, Romania and Slovakia, Pessoa (2016), Menezes-Filho and Muendler (2011) and Mesquita and Najberg (2000) for Brazil, Levinsohn (1999) and Edwards and Edwards (1996) for Chile, and Rama (1994) for Uruguay. There are also several important papers suggesting that trade has no impact on unemployment. Trefler (2004) provides such evidence for Canada for his long-run estimates. Bentivogli and Pagano (1999) show that trade has little or no impact in France, Germany, Italy and the United Kingdom of Great Britain and Northern Ireland. Goldberg and Pavnick (2005) findings suggest that there is no impact of trade on unemployment in Colombia. Hasan et al (2012) obtain similar results for India. Finally, there is also evidence suggesting that trade opening has led to reductions in unemployment. Kee and Hoon (2005) and Nathanson (2011) show that this is the case in Singapore and Israel, respectively. Milner and Wright (1998) found that openness reduce unemployment in Mauritius. Lee (2005) shows that trade growth reduced unemployment in China, India and Malaysia. Felbermayr, Prat and Schmerer (2011) show that in the long-run, higher trade openness is associated with a lower structural rate of unemployment. The fact is established using both a panel data from 20 OECD countries, and using cross-sectional data on a larger set of countries. Their benchmark specification suggests that "a 10 percentage point increase in total trade openness reduces aggregate unemployment by about three quarters of one percentage point". Heid and Larch (2016) evaluate the effects of regional trade agreements (RTAs) for sample of 28 OECD countries. Employment effects are positive in most cases. Moreover they find that introducing RTAs as observed in 2006 leads to greater welfare increases when accounting for aggregate employment effects. Dutt, Mitra and Ranjan (2009) provide evidence that more open economies have lower unemployment rates on average for a large sample of developing and developed countries. In an earlier study, Currie and Harrison (1997) assess the impact of trade reform on employment in manufacturing firms in Morocco in the 1980s. This paper does not investigate the direct impact of trade reform on unemployment but offers insights on the role of trade protection on labour market composition. Their results suggest that employment in the average firm has been unaffected by the reduction of tariffs and the elimination of quotas. However, exporting firms and industries most affected by the reforms (textiles, beverages and apparel) experienced a significant decline in employment. Currie and Harrison (1997)'s results further indicate that government-controlled firms behaved quite differently from privately-own firms. Government-controlled firms actually increased employment in response to tariff reductions, mostly by hiring low-paid temporary workers.

2.3 Reconciling theory and empirics

Recent contributions by Carrère et al. (2014) and Carrère, Grujovic and Robert-Nicoud (2015) have highlighted adjustment mechanisms able to reconcile the a priori contrasting theoretical and empirical results discussed above. Reforms that increase aggregate demand lead to job creation, raising both incomes and wages and reducing unemployment. Aggregate unemployment, which is usually of interest to policy-makers, and real wages, which economists tend to focus on, are, in this view, two sides of the same coin. However, trade reforms also reallocate resources across sectors, and sectors have heterogeneous labour market frictions. If a trade reform reallocates labour to a sector with high frictions, unemployment increases, and vice versa. This mechanism illustrates why real income and frictional unemployment effects of trade liberalisation can be imperfectly correlated.

In the context of a trade reform Carrère et al. (2014) theoretical predictions indicate that trade openness has an ambiguous effect on unemployment. The sign of this effect depends on the correlation between sector level labour market frictions and revealed comparative advantage. More precisely, if positively correlated, then opening up to trade is expected to increase unemployment. If negatively correlated, then opening up to trade is expected to reduce unemployment. Hence, aggregate unemployment would fall only if a trade reform leads to the reallocation of labour towards sectors with relatively low labour market frictions assuming that the overall expansion effect is positive. In other words, reallocation effects may dampen real income effects on unemployment and possibly welfare. Empirical results presented below confirm these theoretical predictions. Moreover, predictions based on their estimated correlation coefficients are in line with evidence based on single country case studies discussed previously.

3. Empirical strategy

There are 23 sectors in our data. We put forward the following empirical model in order to test the qualitative predictions retrieved form the theoretical framework:

$$ln(u_{ct}) = \beta_c + \beta_t + \beta_1 \rho_{ct} + \beta_2 ln(w/p)_{ct} + \epsilon_{ct} \quad (1)$$

where u_{ct} is aggregate unemployment in country c at time t, ρ_{ct} is the correlation between the country's comparative advantage and its sector level labour market frictions, w/p_{ct} is real wages which is proxied with GDP per capita to also control for business cycles, and ϵ_{ct} is an *i.i.d* error term. β_c and β_t are country and time-specific fixed effects, respectively. The former control for any time-invariant determinant of unemployment, such as differences in institutional setups at the aggregate level, and the latter for aggregate shocks that may affect unemployment in all countries in a given year, such as global technological shocks. The reference theoretical framework predicts a positive coefficient for the correlation variable ($\beta_1 > 0$). Having a comparative advantage in sectors with more inefficient labour markets is associated with higher aggregate unemployment rate, ceteris paribus. Real wages and the unemployment are expected to be negatively related. We should thus obtain $\beta_2 < 0$. A larger income per capita is associated with a lower level of unemployment.

A measure of the correlation between comparative advantage and labour market frictions for each country and year is required in order to implement the empirical model. In order to compute this correlation, we thus need measures of both comparative advantage and labour market frictions at the sector level.

3.1 Measuring comparative advantage

As a measure of comparative advantage we use Costinot, Donaldson and Komunjer (2012) methodology based on a fixed-effect gravity model. For every year t we estimate

$$ln(x_{cpz}) = \alpha_{cp} + \alpha_{cz} + \alpha_{pz} + \epsilon_{cpz} \quad (2)$$

where subscript c stands for the exporting country, p for partners and z for sectors, and therefore x_{cpz} are exports of good z from country c to partner p. We are interested in the α_{cpz} fixed-effects which after a monotonic transformation provide a measure of the export capability of country c in tradable sector z relative to a benchmark country. Comparative advantage of country c in sector z is then given by

$$r_{ctz} = e^{\alpha_{ctz}/\sigma} \quad (3)$$

Where σ is the elasticity of exports with respect to productivity. We use Costinot, Donaldson and Komunjer's (2012) estimate of $\sigma = 6{:}53$ to compute r_{ctz}. As a robustness test we also use Hanson, Lind and Muendler's (2015) normalization. They argue that, because of the presence of the importer-industry fixed effect in (2), export capability is only identified up to an industry normalization. This normalization differences out both worldwide industry supply conditions and worldwide industry demand conditions.

3.2 Measuring sector level labour market frictions

The second component of ρ_{ct} is the vector of the unemployment rates at the sector level. We face two constraints given the available data. First, to the best of our knowledge there exist no data on sector-specific labour market frictions or unemployment covering a wide range of countries and time periods. We thus need to estimate unemployment rates at the sector level. Second, the time period we use is relatively short and there

is insufficient time variation to identify unemployment rates at the sector level using a within estimator. In order to estimate the unemployment rates at the sector level, our identifying assumption is that u_z is common across all countries and constant over time. We relax the assumption that u_z is the same across all countries in the robustness subsection 4.2. The unemployment rate of any country is a weighted average of the unemployment rates prevailing in the sectors active in this country. Let L_{ct} and L_{ctz} denote the aggregate and sector-z labour forces of country c in year t, respectively; under our identifying assumption, we may then write the accounting identity linking aggregate unemployment u_{ctz} in c in year t and u_z as,

$$u_{ct} = \sum_{z=1}^{23} \omega_{czt} u_z \text{ , where } \omega_{czt} \equiv \frac{L_{ctz}}{L_{ct}} \quad (4)$$

is the share of sector z in the labour force of country c at time t, with $\sum_{z=1}^{23} \omega_{czt} = 1$

We observe the left-hand-side of (4) but we observe neither u_z nor the vector of workforce at the level of sectors, L_{czt} (which includes job seekers as well as current employees). However, we do observe employment in each sector H_{czt}; in turn, we exploit the fact that H_{czt}, L_{czt}, and u_z are related by the following identity,

$$L_{ctz} = H_{ctz} + u_z L_{ctz} = \frac{H_{czt}}{1-u_z} \quad (5)$$

By the same token, we may write $L_{czt} = \sum_{z=1}^{23} \frac{H_{czt}}{1-u_{ct}}$. Substituting this expression and (5) into (4) yields

$$\frac{u_{ct}}{1-u_{ct}} = \sum_{z=1}^{23} \frac{u_z}{1-u_z} \frac{H_{czt}}{H_{ct}}$$

Where $H_{ct} = \sum_{z=1}^{23} H_{ctz}$ is aggregate employment.

Adding an *i.i.d.* error term to this expression to allow for measurement error in u_{ct} (which may include country and year fixed components), and defining employment shares as $\overline{\omega}_{ctz} \equiv \frac{H_{ctz}}{H_{ct}}$, we obtain:

$$\frac{u_{ct}}{1-u_{ct}} = \sum_{z=1}^{23} \beta_z \, \overline{\omega}_{czt} + \epsilon_{ct} \quad (6)$$

where $\beta_z \equiv \frac{u_z}{1-u_z}$ can be estimated by ordinary least squares and the value of u_z can be recovered by $u_z = \frac{\beta_z}{1-\beta_z}$.

We estimate u_z using data for 1995-2009 under our identifying assumption $u_{ctz} = u_z$. We relax the assumption that u_z is common across all countries in the sample to allow u_z to first vary by region and then by country in subsection 4.2, which allows for labour market frictions to be a source of comparative advantage as in Cuñat and Melitz (2012). We also address potential endogeneity concerns associated with the estimation of (1) and the construction of (6) in subsection 3.4 below.

Table 1 provides the estimated u_z and their bootstrapped standard errors for 21 manufacturing sectors, and two broad agriculture and services sectors. These values can be interpreted as sector-specific unemployment rates (in %) due to labour market frictions. The mean and a median of this distribution are around 15 percent with a standard deviation of 5, a maximum of 25 and a minimum of 6 percent.

We interpret a higher union membership rate as a proxy for a higher worker bargaining weight in the wage bargaining process. We can then test the external validity of our sector-specific labour market frictions by correlating our estimates with an index of labour union incidence in the United States of America constructed

using data from the Union Membership and Coverage Database. The available estimates are compiled from the Current Population Survey.[3] We use estimates for the period 1995-2009.

Figure 1 plots union membership (expressed as a share of total employment) in sector z against our measure u_z. The figure also reports the underlying linear correlation and the 95 percent confidence interval; the estimated correlation is positive (slope = 0.27) and statistically different from zero (standard error = 0.08). Similar results are obtained using data by Robinson (1995) for forty Canadian industries.

3.3 Correlation between labour market frictions and revealed comparative advantage

Equipped with our measures of comparative advantage r_{czt} and sector level labour market frictions u_z, we can construct the correlation between labour market frictions and labour market inefficiency, ρ_{ct}. Table 2 displays the median ρ during the period 1995-2009 for each country in our sample. We rank countries from the lowest to the highest ρ. The country with the highest ρ is the Russian Federation, suggesting that more open trade is associated with higher unemployment in this country. At the other end of the spectrum, the country with the lowest ρ is Israel, which makes it the country where trade liberalization is the most likely to result in a fall in unemployment. Note that Brazil, Chile, Czechia, Poland, Romania, Slovakia, and Uruguay, which are countries for which existing studies suggest that trade liberalization contributed to increases in unemployment, are among the countries with the highest ρ. Similarly, Singapore and Israel, which are countries for which existing studies suggest that trade liberalization contributed to a decline in unemployment, are among the countries with the lowest ρ. This prima facie evidence is in line with the theoretical predictions of our model.[4]

3.4 Identification issues

There are three potential issues associated with the estimation of (19). We address them in turn. The first source of concern is associated with the fact that aggregate unemployment rates are used to construct our measures of sector market frictions at the sector level; these are in turn used to construct our key right-hand side variable, ρ_{ct}, on which we regress u_{ct}. Thus, there seems to be a cause of endogeneity. Before proceeding to propose a correction to this source of bias, note that the problem is strongly mitigated by the fact that we do not regress u_{ct} on u_z in (19) -which would lead to a simultaneity bias by construction- but on ρ_{ct}, which is the correlation between country c's comparative advantage and u_z. We aim to rule out any remaining potential concern by undertaking four different robustness tests. First, instead of using our measure of u_z to compute ρ_{ct}, we use the measure of unionization rates by sector in the United States of America provided in the Union membership and coverage dataset used in Figure 1. This circumvents any circularity concern. Second, we divide our sample into two sub-periods and estimate ρ_{ct} with data for the early period