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On the Impact of Structural Reforms on Output and Employment: Evidence from a Cross-country Firm-level Analysis

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Abstract

This paper analyzes the effects of selected structural reforms on output and employment in the short and medium term. It uses a comprehensive cross-country firm-level dataset covering both advanced and emerging market economies over the period 2003–14. In line with previous studies, it finds that structural reforms have in general a positive impact on output and employment in the medium term. Furthermore, the paper also assesses whether the impact of structural reforms varies with firm-specific characteristics, such as size, leverage, profitability, and sector. We find evidence that firm characteristics do influence the effectiveness of structural reforms. These findings have relevant policy implications as they help policymakers tailor the design of structural reforms to maximize their payoffs, taking into account their heterogenous impact on firms.

JEL Classification Numbers: L51; D04; D22.

Keywords: structural reforms; firm-level data; Orbis dataset; potential growth.

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I. INTRODUCTION

Since the global financial crisis policymakers across the world have been grappling with subdued growth. Data suggest that the recent growth slowdown was mainly the result of a deceleration in productivity growth combined with other secular forces, such as low population growth and structural transformation (IMF 2015, 2017; Eichengreen, 2015). While the productivity slowdown could already be observed in advanced economies before the crisis, the slowdown in emerging markets became more evident after 2010. Reviving productivity growth is particularly important for emerging markets to allow for convergence toward higher living standards and lift their population out of poverty. In this context, structural reforms have been identified as a key remedy to lift potential growth over the medium term by boosting productivity.

Structural reforms cover a wide range of measures that, in principle, can tackle obstacles to an efficient resource allocation. Thus, by increasing the flexibility of the economy to respond effectively to changes in economic fundamentals, structural reforms can raise productivity, employment, investment, and efficiency in the production of goods and services, thereby ultimately making a country more resilient to shocks (Culiuc and Kyobe, 2017). Such reforms are usually undertaken in labor and product markets, trade, and institutional framework. Where high cost of labor dismissal prevents firms from adjusting to economic downturns, labor market reforms that reduce those costs can make labor markets more adaptable to changes in the economy and lead to higher employment in the long run. Product market reforms that, for example, reduce the entry barriers in network sectors, such as electricity and telecommunications, typically increase competition and reduce price mark-ups, decreasing the rents of a few protected firms (Blanchard and Giavazzi, 2003), while allowing for cheaper and often better goods and services provision, thereby also benefiting consumers. Trade reforms, such as the reduction in tariffs and the loosening of non-tariff barriers, can also improve resource allocation across countries, reduce rents, and promote technology transfers (Alfaro et al., 2009). Institutional reforms, such as a stricter enforcement of contracts and property rights, a faster resolving of insolvencies, and reductions in red tape and corruption, can also lead to more investment by reducing firms' costs of adjusting the capital stock in reaction to changes in fundamentals (Alesina et al, 2005). That said, the payoffs from alternative structural reforms depend on various country-specific factors, including the stage of development (Dabla-Norris, Ho and Kyobe, 2016; IMF, 2015; and Prati et al., 2013). In particular, previous studies suggest that advanced economies tend to generate larger marginal gains from financial market deepening and product and labor market reforms, while developing countries benefit more from trade liberalization and less state intervention in agriculture. This indicates that countries should prioritize structural reforms according to their level of development.

While related studies have assessed the effects of structural reforms, the role of sectoral and firm characteristics in affecting these payoffs has been less explored, which is the main focus of this paper.[1] This paper studies the effects of labor, product market, trade, and institutional reforms on firm-level output and employment growth using a local projection method. It uses a firm-level

[1] See IMF (2016) and Gal and Hijzen (2016) for an analysis of labor and product market reforms, using micro-data, in advanced economies.

panel dataset covering 30 advanced and emerging economies over the period 2003-2014, with over 4 million firm-year observations. Beyond revisiting the role of standard macroeconomic variables, we also analyze whether the effects of structural reforms depend on firm characteristics, such as size, profitability, leverage, and sector. Our goal is to better understand the mechanisms through which structural reforms operate, as well as uncover the heterogenous effects of structural reforms on different firm types, which would help improve the design of these reforms. Finally, the granularity of our firm-level data allows us to control for unobserved variables that affect productivity and structural reforms simultaneously at the country level through a richer set of fixed effects.

In line with previous studies, our results indicate that structural reforms do have a positive effect on output and employment, particularly over the medium term. The effect of structural reforms on output tends to be larger than on employment, suggesting that structural reforms increase firm productivity. Furthermore, we find differential payoffs from different reforms. Product market and institutional reforms seem to have higher payoffs than labor market and trade reforms during our relatively short sample period. However, this may be so because labor market reforms were identified during economic downturns in our sample and the effects of labor reforms were previously found to be procyclical (IMF, 2016). At the same time, most trade reforms were already implemented before 2004.

Our findings also suggest that the effects of structural reforms vary with firm characteristics. Specifically, labor market reforms are more beneficial for large, high-skill, and low labor-intensive firms. Intuitively, larger firms have a greater likelihood of being subject to organized labor and thus, labor regulations are generally more binding for them. Large firms tend also to be more flexible to benefit from less stringent labor regulations by reallocating resources to increase productivity. Product market reforms have stronger positive effects on more leveraged, low-skill, and service-oriented firms, signaling that the benefits of this reform act through lower input prices for firms relying more on intermediate inputs from network sectors. Trade reforms appear to provide additional benefits to more profitable, leveraged, and service firms. This may be because profitable firms are more able to compete with international competitors and leveraged firms benefit from the financial sector liberalization embedded in trade reforms. Moreover, the recent trade liberalization experience across most countries in our sample had a higher focus on services. Finally, the effects of institutional reforms are larger for service firms. In general, leveraged and service firms tend to profit more from structural reforms. Leveraged firms profit more from lower input prices and broader access to financial services, while recent structural reforms have focused more on service sectors, as these are usually more regulated than manufacturing sectors. These results emphasize that structural reforms affect different types of firms unevenly and have important heterogenous effects that policymakers should be aware of.

The remainder of the paper is structured as follows. Section II summarizes the burgeoning literature on structural reforms. Section III discusses the methodology. Section IV describes the data on structural reform indices, including how the structural reform shocks are identified, as well as the firm-level data. Section V presents the results and conducts an analysis of the mechanisms

through which structural reforms operate by comparing how the effects of structural reforms vary across different firm characteristics. Section VI conducts several robustness checks. Finally, Section VII concludes.

II. LITERATURE REVIEW

The recent decline in productivity has induced a rising interest on the effects of structural reforms. Several studies at the sector (Dabla-Norris et al., 2015; Bouis, Duval and Eugster, 2016) as well as firm level (Bertrand and Kramarz, 2002; Fabrizio et al., 2007; Goolsbee and Syverson, 2008; Schivardi and Viviano, 2011; Arnold et al., 2016; Gal and Hijzen, 2016; IMF, 2016; Lanau and Topolova, 2016) have shown that structural reforms increase productivity and that their effects take time to materialize. These studies are, however, largely focused on advanced countries.

IMF (2016), Adascalite and Morano (2016), and Duval and Furceri (2017) find, in a sample of advanced economies, that the effect of different types of labor market reforms depend on business cycle conditions. Reductions in labor tax wedges and increases in public spending on active labor market policies have larger effects during contractionary periods, while the effects of lowering employment protection and benefits are procyclical. Bassanini and Duval (2009) find that labor productivity tends to be weaker in industries with more stringent employment protection. In line with this finding, Bassanini et al. (2000) show that industries with more binding layoff restrictions suffer from lower productivity growth under mandatory dismissal regulations. Henrekson and Johansson (2010)'s results suggest that less stringent labor market institutions increase aggregate productivity by reallocating labor to more productive firms and through firm entry and exit.

For product market reforms, IMF (2016) shows that they have always positive effects on output and employment growth, independently of the business cycle. Lanau and Topolova (2016) combine firm-level data from Italy with product market reform indicators during 2003–13 to find that deregulation in network sectors has a positive impact on the value added and productivity of firms in these sectors, as well as on firms using these intermediate inputs in their production process. They also find that these effects are stronger in Italian provinces with more efficient public administration, emphasizing the need for complementary policies to augment the benefits of structural reforms. Gal and Hijzen (2016) use firm-level data for OECD countries to document the positive impact of product market reforms on employment, capital, firm entry, and output of firms in the deregulated sectors. Quite importantly, they find that the positive effects are weakened for credit-constrained firms, larger firms in network industries, and smaller firms in retail trade.

There is an extensive literature that studies the effects of trade liberalization on firms, with consistent evidence pointing to a reallocation towards more productive firms and products (Pavknick, 2002; Melitz, 2003; Muendler, 2004; Amiti and Konings, 2007; Fernandes, 2007; Bernard et al., 2007; Topalova and Khandelwal, 2010; Eaton, Kortum and Kramarz, 2011). The evidence suggests that firms' initial level of productivity is an important determinant of the extent of gains from trade reforms. There is also evidence that other firm characteristics, such as size, import intensity of inputs, and financial health, play an important role. For example, Nataraj (2011)

finds that India's unilateral reduction in final goods tariffs increased the average productivity of small, informal firms, whereas reduction in input tariffs led to an increase in productivity among larger, formal firms. Furthermore, liquidity constraints of firms can severely impede their ability to export both at the extensive margin and intensive margin (see for example Minetti and Zhu, 211; Manova, 2012; Chaney, 2016).

The quality of institutions has been established as a critical driver of private investment and entrepreneurship. Seminal work by Acemoglu, Johnson and Robinson (2005) suggests that differences in economic institutions are the fundamental cause of differences in economic development. Laeven and Woodruff (2007) show that improvements in the quality of legal systems lead to increased firm size by reducing the idiosyncratic risk faced by firm owners. Beck, Demirgüç-Kunt, and Maksimovic (2005) find that effects of financial, legal and corruption constraints on firm's growth is exacerbated for the smallest firms.

Against this burgeoning literature, the main contribution of our paper is twofold. First, we extend the analysis beyond advanced economies by including firms from emerging markets in our sample. Our findings suggest that the macroeconomic effects of structural reforms on emerging markets are broadly similar to the effects in advanced economies. Second, we analyze in a comprehensive manner the effect of different types of structural reforms which enables us to tease out the differential effects of reforms on output and employment at the firm level. These findings provide a richer perspective on the effects of reforms based on firm-level characteristics. In particular, the paper highlights the heterogenous effects of alternative structural reforms, which are important to keep in mind in order to design measures that can deliver strong and inclusive growth.

III. METHODOLOGY

Baseline specification

We are interested in assessing the impact of structural reforms on firms' output and employment growth over time. For this purpose, we derive impulse response functions using the local projection method (Jordà, 2005; Teulings and Zubanov, 2014). [2] Specifically, our main regression specification is:

$$y_{isc,t+h} - y_{isc,t-1} = \beta_{0,h} + \beta_{1,h}R_{ct} + \beta_{2,h}X_{isc,t-1} + \beta_{3,h}\left(gdp_{c,t+h} - gdp_{c,t-1}\right) + \mu_s + \varphi_c + \omega_t + \varepsilon_{isc,t+h}, \forall h = 0,1,2,3,4,5.$$

, where the subscript isc,t refers to firm i, in sector s, country c, and year t. y is the log of output (log of employment); R refers to a structural reform shock as defined below and is an indicator

[2] A key advantage of the LPM over a VAR is that the former is more robust to misspecification, as it does not require identification restrictions. Furthermore, non-linear specifications can be easily introduced.

variable that equals one in the event of a major structural reform, and 0 otherwise; X are firm-specific characteristics that may influence output growth such as size (measured taking the log of total assets)[3]; $(gdp_{c,t+h} - gdp_{c,t-1})$ is a country's cumulative GDP growth; and $\mu_{s,}$ φ_c, and ω_t are sector, country, and year fixed effects, respectively. Finally, h is the horizon of the impulse response function.

We control for firm size as this variable is likely to have a large influence on a firm's productivity by being correlated to access to finance, export status, and leverage. We also include a country's cumulative growth rate over the period of interest to control for changes in the economy-wide business conditions and alleviate concerns of endogeneity with the timing of the structural reforms, as higher GDP growth may influence the likelihood of reforms and increase firms' output at the same time. Sector and country fixed effects capture time-invariant characteristics, such as the education level of the workforce, distance to frontier, trade openness, and regulations in place that will influence firms' output growth, while year fixed effects capture common trends across countries, such as the global financial crisis. A robustness check considers the inclusion of a richer set of fixed effects.

We are mainly interested in the sign and significance level of the coefficients $\beta_{1,h}$, i.e. we want to know whether structural reform shocks have a significant impact on output (employment) growth at different horizons, and whether it is positive or negative. Standard errors are robust and clustered at the frequency of the structural reform shock which is our variable of interest. Thus, standard errors are clustered by country and year[4] in the case of labor market, trade, and institutional reform shocks, and by country and sector in the case of product market reforms. The equation above is estimated for each horizon of $h \in \{0,..,5\}$ and impulse response functions are computed using the estimated coefficient $\beta_{1,h}$ with the corresponding 90 percent confidence band level associated with the estimated standard errors of $\beta_{1,h}$. We assume that the shock happens at period t=0.

Interaction of structural reforms with firm characteristics

In a second step, we modify the baseline specification to allow the effect of structural reforms to vary with firm characteristics in order to get a better understanding of the mechanisms through which structural reforms operate and their heterogenous impact. Specifically, for every firm characteristic (size, profitability, leverage, sector, skill level of the labor force, labor intensity, and technological intensity) we calculate a dummy which indicates whether the firm is above the median of this firm characteristic in its country and interact this dummy with the structural reform shock variable in the following specification:[5]

[3] To avoid endogeneity issues, these firm characteristics are fixed and taken from the year previous to the shock.
[4] The results do not change if the standard errors are clustered by country only.
[5] Again to avoid endogeneity issues, this firm characteristic dummy does not change over time and is based on values one year prior to the structural reform shock.

$$
\begin{aligned}
y_{isc,t+h} - y_{isc,t-1} &= \beta_{0,h} \\
&+ \beta_{1,h} R_{ct} + \beta_{2,h} R_{ct} \times d_i + \beta_{3,h} d_i + \beta_{4,h} X_{isc,t-1} + \beta_{5,h} \left(gdp_{c,t+h} - gdp_{c,t-1} \right) \\
&+ \mu_s + \varphi_c + \omega_t + \varepsilon_{isc,t+h}, \forall h = 0,1,2,3,4,5.
\end{aligned}
$$

We then check the sign and significance of the coefficient $\beta_{2,h}$ to determine whether a specific firm characteristic influences the magnitude of the effect of structural reforms.

IV. DATA

Structural Reforms

Data on structural reforms come from a variety of sources. For labor market regulations, we focus on dismissal protection reforms, more specifically on the *mandated cost of worker dismissal* from the World Bank's Ease of Doing Business Report, as this index has the widest country coverage. For product market reforms, we use the *OECD Regulatory Impact index* which measures the cost of anti-competitive regulation in upstream network sectors (energy, transport, and communication) on 37 downstream sectors that use intermediate inputs from these network sectors in their production. When calculating the cost of regulation this index takes into account the input-output linkages between sectors. For trade regulations, we use the index measuring the *non-tariff regulatory trade barriers* from the Fraser Institute. The focus on non-tariff trade barriers is mainly because most tariff reductions happened already in the 1990s and have been extensively studied in the literature.[6] For institutional reforms, we take the *legal rights* index from the Fraser Institute. This measure has been commonly used in the literature studying the effects of sound institutional and legal systems, including IMF (2015) and Dabla-Norris et. al (2016). Quality institutions can promote investment by reducing uncertainty and improving the efficiency of resource allocation, thereby boosting productivity growth. All reform indices are available at an annual frequency. Product market indices are available from 1975 to 2013 while all others are available from 2000 to 2014.[7] However, since firm-level data are available only from 2003 to 2014 and we want to measure the effect of structural reforms over a 5-year period, we consider structural reforms between 2004 and 2009. We have to start in 2004 because the firm characteristics used as controls are lagged. Appendix A and Figure 1 provide more details on the structural reform dataset.

We transform all indices so that a higher value implies more liberalization, i.e. lower costs, less regulation and government intervention, and lower trade barriers. The reform indices change little

[6] Tariff measures have commonly been used to study the effects of trade reforms on productivity. However, much of the tariff reductions took place between the 1980s and 1990s. The tariff rates are already at low rates, close to the frontier, so any changes we capture in the 2000s would be small. In fact, we find no significant evidence of lower average tariff rates having any positive effects on firm output or productivity in line with previous studies (IMF, 2015; Dabla-Norris et al., 2016). Hence, given our focus on regulations, we study the effects of deregulating non-tariff trade barriers instead.

[7] Mandated cost of dismissal, trade, and institutional reform indices are available at a five-year frequency between 1970 and 2000.

from year to year. Following previous studies, in particular Bouis et al. (2012a, 2012b), a reform shock is identified as an increase in the structural reform index that exceeds two standard deviations of the change in the indicator over all observations in the sample, and the reform variable is defined as a dummy variable which takes a value of one when a reform shock is observed.[8] The focus on large episodes allows us to treat them as a shock and to estimate impulse responses using a dynamic specification.[9] Further, the identification strategy also reflects evidence that the marginal effect of reforms tend to be greater when the policy reform is large. While discretizing the reform measure neglects its intensity, it also partially attenuates endogeneity issues. In robustness checks, we repeat the analysis with two alternative identification methodologies: one that takes the 5 percent largest changes in the reform indices, and another that uses the absolute changes in the reform indices, exploiting the variations in the size of the reform.

The incidence of reform shocks is relatively rare. Table 1 shows the identified reform shocks for the countries in our firm-level sample. In our sample the incidence of reform shocks is on average 4 percent of all potential country-year (or country-sector-year in the case of PMR) observations. Reforms reducing the cost of worker dismissal were the most observed in this period with a 6 percent incidence, while the other reform shocks have an incidence of around 3 percent. All labor market reforms in our sample happened in 2009, following the outbreak of the financial crisis. In our sample most product market reforms happened in Korea, Slovenia, and Spain. Korea experienced the highest number of structural reforms shocks in our sample, with reforms in all areas, except in the labor market. As a check, we were able to validate the reform shocks identified with our approach of using two standard deviations with evidence from news articles and IMF staff reports. For instance, Bosnia and Herzegovina joined the CEFTA trade agreement in 2006. Similarly, Bulgaria and Romania liberalized trade, particularly in services, in addition to lowering trade tariffs in the years prior to their ascension to the EU in 2007. Hungary also privatized several companies in upstream sectors in the period 2007-09, such as the national airline company and the rail freight of the national railway company.

Firm-level data

The firm-level data come from the Orbis dataset. The sample covers the years 2003-14 and contains around 4 million firm-year observations coming from 30 countries. Of these 30 countries, 11 are emerging markets which account for around 40 percent of the firm-year observations. This sample is constructed after using several cleaning criteria: i) we drop micro firms with less than 4 employees; ii) we restrict the sample to firms from non-agricultural market sectors (ISIC 5-82), iii) only firms present in the dataset in at least 5 consecutive years are kept so that we can analyze the impact of reforms 5 years ahead and the panel is locally balanced; iv) firms' financial accounts need to refer to the whole fiscal year; v) the financial accounts are either unconsolidated, consolidated but without an unconsolidated counterpart, or the consolidation status is unknown;

[8] For OECD product market reforms, we use 1 standard deviation as the cutoff for reform shocks to have a large enough sample that allows for identification of effects.

[9] See Bordon, Ebeke, and Shirono (2016) for more details on the measure of reform shock.

vi) all firms in the sample need to have non-missing and strictly positive values for employment, assets and gross output (measured in terms of operating revenue) in all years; and vii) a country is included in the sample if it has at least 1,000 firm observations in every year of the sample. We deflate all nominal variables using the WEO GDP deflators. We opt for aggregate deflators to keep our sample as large as possible. A robustness check using sector-level deflators from the WIOD SEA[10] and still keeping 75 percent of the original sample shows that results are robust to the choice of deflators. The coverage of the firm-level data is presented in Table 2.

The outcome variables are firms' output and employment growth, whereby output is proxied by a firm's operating revenue and employment by the number of employees. Ideally, one would use TFP growth instead of output growth as an outcome variable, but to calculate TFP growth we would need data on a firm's value added and capital stock, which would in turn considerably reduce the size of our sample. In addition, there is considerable uncertainty about how to measure TFP. As a robustness check, we show that the results hold if we use labor productivity growth, defined as output divided by the number of employees, instead of output growth.

A key question addressed in the paper is whether the effect of structural reforms vary with different firm characteristics. In this regard, we focus on several firm characteristics that can potentially attenuate or strengthen the effects of structural reforms:

Size. Size is proxied by the log of a firm's total assets. It is important to understand whether small or large firms profit more from structural reforms to understand structural reforms' effects on a country's enterprise landscape and employment, and to design potential compensating measures. In many countries a large share of the population is employed in smaller firms, thus reforms that have an adverse impact on small firms could have a significant impact on aggregate employment and welfare. When studying the effects of product market reforms on the firms being deregulated, Gal and Hijzen (2016) find that smaller firms benefit more in network sectors, while larger firms benefit more in retail sectors. They argue that network sectors tend to be characterized with greater market concentration, therefore removal of entry barriers forces larger firms to cut back on investment and employment so as to defend their market share (thereby gaining relatively less than smaller firms). In contrast, in the retail sector, large competitive firms extend their operations further after liberalization, while traditionally-operated smaller firms suffer. In general, if smaller firms experience higher post-reform growth, this suggests that smaller firms are constrained by the structural rigidities while larger firms are able to overcome these constraints by themselves.

Profitability. Profitability is proxied by return on assets, with return measured by the EBITDA of a firm. Structural reforms can increase aggregate profitability either by increasing the profitability of the most productive firms and/or by closing the profitability gap across firms. Structural reforms are in general expected to increase profitability by lowering input prices. At the same time, the firms directly affected by deregulation will experience stronger competition and only the most productive firm will likely benefit more.

[10] World Input-Output Database, Socio Economic Accounts, (Timmer et al., 2015).

Leverage. Leverage is proxied by the ratio of total debt to assets. Several studies have shown that firms' financial health, leverage, and access to external financing are important determinants of their behavior (Aivazian et al., 2005; Margaritis and Psillaki, 2010; Coricelli et al., 2012; Campello, 2006; Harrison and McMillan, 2003). Nucci et al. (2005) find that leverage has a negative impact on productivity, while Margaritis and Psillaki (2010) and Coricelli et al. (2012) find a positive impact, the latter showing that the effect of leverage on productivity vary with the leverage level. Gal and Hijzen (2016) find that credit constraints (defined as dependence on external financing) can play an important role in weakening the positive impact of product market reforms on investment. It is not clear in which direction leverage should affect the impact of structural reforms on output. On the one hand, high leverage may signal access to credit and good investment opportunities what would enhance the effects of structural reforms. On the other hand, high leverage may also hinder future access to credit and weaken the impact of structural reforms. At the end, it is an empirical question and past studies have found evidence on both sides of the debate.

Sector. Some countries rely more on manufacturing than services and vice-versa and this could lead to different payoffs from structural reforms. In addition, the share of the service sector tends to increase with a country's development. With manufacturing typically more open to trade and subject to less regulation in most economies, there may be more scope for deregulation in the service sector. Finally, manufacturing and service sectors may differ in the intensity of the inputs used from the deregulated sectors. Looking at the effect of product market reforms, Gal and Hijzen (2016) find that manufacturing firms profit more than service firms. They argue that competition is stronger in manufacturing sectors leading to a higher output-price elasticity, what amplifies the effects of lower input prices on output. In addition, they argue that manufacturing sectors use more inputs from network sectors for production.

Labor force skill level. Labor force skill level is proxied by the average wage level a firm pays its employees. Without distortions, a higher wage would indicate a higher marginal productivity of labor and more skilled labor. If structural reforms are more beneficial for firms with more skilled labor, reallocation towards more productive firms would result in higher aggregate productivity. In contrast, higher payoffs from structural reforms to firms with low skilled labor is indicative that removing structural rigidities allow firms with low labor productivity to grow.

Labor intensity. Labor intensity is proxied by dividing total costs of employees by operating revenues. Structural reforms that benefit more labor-intensive firms can lead to higher employment and are particularly important for countries with high unemployment rates.

Technology intensity. Technology intensity is proxied by dividing the consumption of ICT intermediate inputs by total gross output in the firm's sector.[11] Firms with more use of ICT

[11] Data on the consumption of ICT intermediate inputs at the sectoral level come from the World Input-Output Database (Timmer et al., 2015). This measure is at the sector level because of data constraints. ORBIS does not have data on the ICT inputs.

intermediate inputs are likely more productive. We would thus expect such firms to benefit more from structural reforms.

V. RESULTS

Baseline results

Figures 3 and 4 report our baseline results, showing the estimated impulse response functions of the effects of structural reforms on output and employment growth, respectively. The vertical axis shows the cumulative change measured in simple units, i.e. an increase of 0.05 indicates a 5 percent cumulative increase. The baseline results suggest that structural reforms have a significant positive effect on output and that this effect tends to materialize with some lag. The effects on employment are insignificant, suggesting that structural reforms increase labor productivity.

Text Table 1: Summary of the effect of structural reforms on output and employment

Reform	Output		Employment	
	ST	MT	ST	MT
Labor		+		
Product		+		
Trade				
Institutions	+	+		

Note: The short term (ST) is defined as one year after the reform. Medium term (MT) is from year 2 to year 5. The cell is marked with a "+" if at least one of the coefficients (h=2 to 5) is positive and significant at 10 percent confidence level, and with a "-" if the effect is negative and significant at 10 percent confidence level.

The results in Figure 3 suggest that the effect of labor market reforms on output is insignificant in the short term. Instead, the positive output effects materialize only 5 years after the reform implementation. The effect of labor market reforms on employment growth is insignificant in the short and medium term (Figure 4). IMF (2016) shows that employment protection reforms have a procyclical effect on output and employment growth, i.e. they increase output during upturns and decrease output during downturns. Without differentiating between upturns and downturns, IMF (2016) also finds that labor market reforms have no significant effect on output. Since labor market reform shocks were only identified during downturns in our sample, our results are unable to shed light on whether the effects of labor market reforms are positive and significant during upturns.

On the other hand, product market reforms have a significant positive effect on output growth and this effect strengthens over time, indicating that it takes time for the benefits of structural reforms to materialize. The effects of product market reforms on employment growth are not significant, indicating that these reforms likely operate through increased labor productivity. These results are in line with Gal and Hijzen (2016) and IMF (2016), emphasizing the benefits of reduced input prices from network sectors and the better provision of goods and services.

Trade reforms that reduce the non-tariff regulatory trade barriers have positive but statistically insignificant effects on both output and employment in the short and medium terms. The result is not surprising as most trade reforms took place in the 80s and 90s, implying that regulatory trade barriers represent no longer a significant hindrance to firm growth in emerging and advanced economies. Our results are consistent with Dabla-Norris, Ho and Kyobe (2016)'s findings that reducing trade barriers is effective for mostly low-income countries.

Finally, institutional reforms have a positive effect on output growth with no significant effect on employment. These results suggest that firms expand their operations as there is less uncertainty with improved legal systems. Hail and Luez (2006) find that firms under strong legal institutions experience significantly lower cost of capital and invest more. By the same token, Kumar, Rajan and Zingales (2002) also find that improved legal systems increase investment, particularly of firms which rely on intangible assets and the protection of intellectual property.

Heterogenous effects of structural reforms

One of the advantages of working with firm-level data is that it enables us to analyze how the effects of structural reforms vary with firm characteristics and thereby infer potential heterogenous effects of reforms. We consider the following firm characteristics: size, profitability, leverage, sector, the skill of the labor force, and capital, labor, as well as technology intensity. Figure 5 shows how the effect of structural reform shocks on output growth varies with firm characteristics. More precisely, it shows the magnitude of the effect of structural reforms on output growth for each type of firm in the period in which the effect peaks (usually t=5). The significance signs indicate whether the effect of structural reforms is statistically different for different types of firms.

Text Table 2: Differential impact of structural reforms

	Size		Profitability		Leverage		Sector		Labor skill		L intensity		ICT intensity	
	S	L	L	H	L	H	M	S	L	H	L	H	L	H
Labor														
Product														
Trade														
Institutional														

Note: S and L in the case of size stand for small and large, respectively. L and H in the case of profitability, labor skill, and input intensity stand for low and high, respectively. M and S in the case of sector stand for manufacturing and services, respectively. A green cell indicates that a firm below/above the median of a certain characteristic in its country benefits significantly more from the structural reform. The difference in coefficients must be significant at least at the 10 percent significance level. The benefit is measured as an increase in output.

Labor market reforms that reduce the cost of worker dismissal yield stronger returns for larger, high-skilled labor, and low labor-intensive firms. All other firm characteristics do not seem to represent a significant channel through which labor market reforms operate. Large firms are more likely to be constrained by labor contracts and more flexible to benefit from less stringent labor

regulations by reallocating resources to increase productivity. On the other hand, low-skill, and high labor-intensive are more likely to adjust (reduce) activities after a lowering of dismissal costs. All labor market shocks in our sample were identified in 2009 and probably led to a reduction in operations. Furthermore, as previously mentioned, there is evidence that the effects of labor market reforms that lower employment protection are procyclical (IMF, 2016). Hence, it is possible that firms which were more exposed to the reform (such as low-skilled and labor-intensive firms) experienced less output growth because the reform was implemented during an economic downturn.

Product market reforms that lower the costs of inputs in production are found to be more beneficial for more leveraged, service-oriented, and low-skilled labor firms. Product market reforms deregulate network sectors increasing competition and ultimately lowering input costs, such as electricity, transport, and telecommunication costs. The decrease in input costs alleviate liquidity constraints that leveraged firms face. In practice, we find that the deregulation benefits the sector that is being deregulated relatively more (i.e., the service sector). More specifically, Figure 2 shows that the firms being deregulated are the ones which face the highest cost of deregulation and thus the ones which should profit more from deregulation. If we exclude firms from the deregulated sectors (ISIC codes 40-1 and 60-4) from our sample, we find that manufacturing firms profit more from the deregulation, consistent with the findings of Gal and Hijzen (2016) who also excluded the deregulated firms from their sample.

Trade reforms (which have tended to focus on services during the sample period of our study) appear to provide greater benefits to more profitable, leveraged, and service firms. This may reflect the relatively greater ability of high-profitability firms to compete with international firms following trade reforms and benefit from the advantages of global value chains. Lowering non-tariff trade barriers lowers the fixed cost of trading, possibly allowing the most leveraged firms who could not previously engage in trade to do so. Furthermore, this reform often also relates to liberalizing the financial sector, which also typically benefit more leveraged firms.

Finally, institutional reforms result in stronger gains for service firms. Institutional reforms, as defined by the strengthening of the legal system, tend to reduce the uncertainty in doing business in a country and increase the protection of intellectual property, thereby generating more investment. These results are in line with Kumar, Rajan and Zingales (2002) who find that the positive effects of legal institutions on firm size in Europe are especially pronounced in industries characterized by low levels of capital intensity. They argue that all legal systems in Europe are of high enough quality to protect investment in physical capital, hence the effects show up through intangible assets such as intellectual property. We find that these results hold in a sample including emerging markets as well.

These results need to be interpreted with some caution, given standard shortcomings in the data which were also found in other related studies. First, the ORBIS firm-level dataset is not necessarily representative for every country. We tried to mitigate this challenge by including in our sample only countries which have at least 1,000 firm observations per year. The results

presented here show thus the effect for an average firm in our sample. Second, one of the main channels through which structural reforms work is via entry and exit of firms from the economy, particularly for product market reforms, which cannot be explored as the dataset does not have information on entry and exit dates. If a firm disappears from the ORBIS dataset, it is difficult to ascertain whether the firm has ceased to exist or whether it was simply not sampled in that particular year. In order not to bias our results in different horizons of the local projections, we also require that firms in our sample exist in the dataset for at least 5 consecutive years. Since we do not take both entry and exit into account, it is not clear whether our results are biased downwards or upwards. Third, structural reforms are usually undertaken in packages in different areas of the economy, whereas they are considered in our analysis only one at a time with unclear implications for the direction of bias of the results. Fourth, due to the short availability of firm-level data, we had to restrict our study on the effects of structural reforms to a relatively short period from 2004 to 2009. Finally, this paper estimates the time it takes for structural reforms to have an effect on the economy once they are implemented, but it does not consider that it usually takes years to implement structural reforms. These caveats however are not specific to our findings but are a concern for the broader empirical literature on structural reforms using firm-level data.

VI. ROBUSTNESS CHECKS

Alternative measures of the reform shock

We determine the occurrence of a structural reform shock if there was an increase in the structural reform index larger than two standard deviations. As shown previously, this leads to a shock incidence ranging from 2 to 6 percent, depending on the reform shock. We check now whether our results are robust to changing the shock identification. More precisely, we follow Gal and Hijzen (2016) and identify as a structural reform shock the largest 5^{th} percentile changes in each structural reform index in our sample. Figures 6 and 7 show that our results are robust to this change. Another way of measuring structural reforms is to take the absolute change of the reform index as the structural reform variable instead of a dummy to account for the reform intensity. Table 3 shows that our results remain robust.

Sectoral deflators

We deflate firms' output growth using sector-level deflators from the WIOD SEA (Timmer et al., 2015). The sample is then reduced by 25 percent. Figure 8 shows that the results are very similar to the ones using aggregate deflators.

Richer set of fixed effects

Our baseline regressions include sector, country, and year fixed effects. In this robustness check we include a richer set of fixed effects by including firm fixed effects and sector-specific time trends. Figures 9 and 10 show that our results are robust to the inclusion of a stricter set of fixed effects. The main difference is that now product market reforms have a negative impact on

employment. Bassanini (2015) also finds a negative impact of product market reforms on employment.

Labor productivity growth

In line with previous studies, we analyze the effect of structural reforms on output and employment growth. Since the effect on output growth is larger than on employment growth, we infer that structural reforms increase output by raising labor productivity. Alternatively, we can directly measure the effect of structural reforms on labor productivity growth, defined as the change in revenue by employee. Figure 11 confirms that indeed structural reforms increase labor productivity growth.

Deleting predominant countries from the sample

There are four countries (Japan, Russia, Spain, and Ukraine) representing each more than 10 percent of the firm-year observations in our sample that may be driving the results. If we repeat our baseline estimations excluding these four countries from our sample, we arrive at very similar results, as shown in Figures 12 and 13.

VII. CONCLUDING REMARKS

This paper assesses the impact of a diverse set of structural reforms on firms' output and employment growth in emerging and advanced economies using a firm-level dataset with over four million observations. We find that structural reforms lead to higher output at the firm level and that these effects take time to materialize. The results suggest that structural reforms act through an increase in productivity, as the effects of structural reforms are larger and more significant for output growth than for employment growth. Product market and institutional reforms seem to have higher payoffs than labor market and trade reforms during our relatively short sample period (2004-2009). However, this may be so because labor market reforms were identified during economic downturns in our sample and the effects of labor reforms were previously found to be procyclical (IMF, 2016). At the same time, most trade reforms were already implemented before 2004. Our findings emphasize the role that structural reforms can play in lifting potential growth by increasing firms' productivity.

Furthermore, we find that the benefits of structural reforms on firms' output depend on firm-level characteristics, such as size, profitability, leverage, and sector. These results point to the importance of targeting structural reforms to economies based on their firm and sector characteristics to maximize their returns. They also emphasize the usefulness of complementary policies that can mitigate the costs that may arise from the redistribution.

Figure 1. Structural Reform Indices (cont'd)

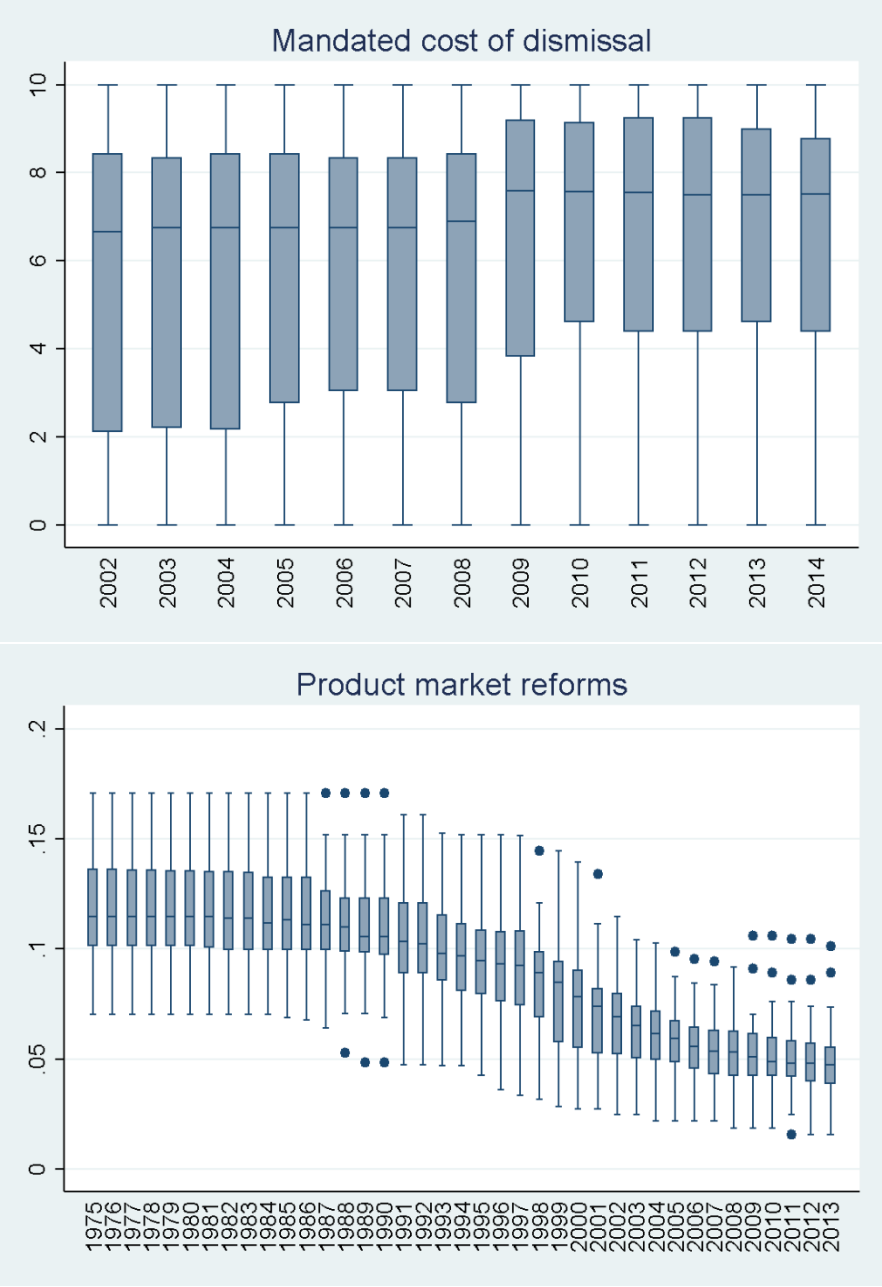
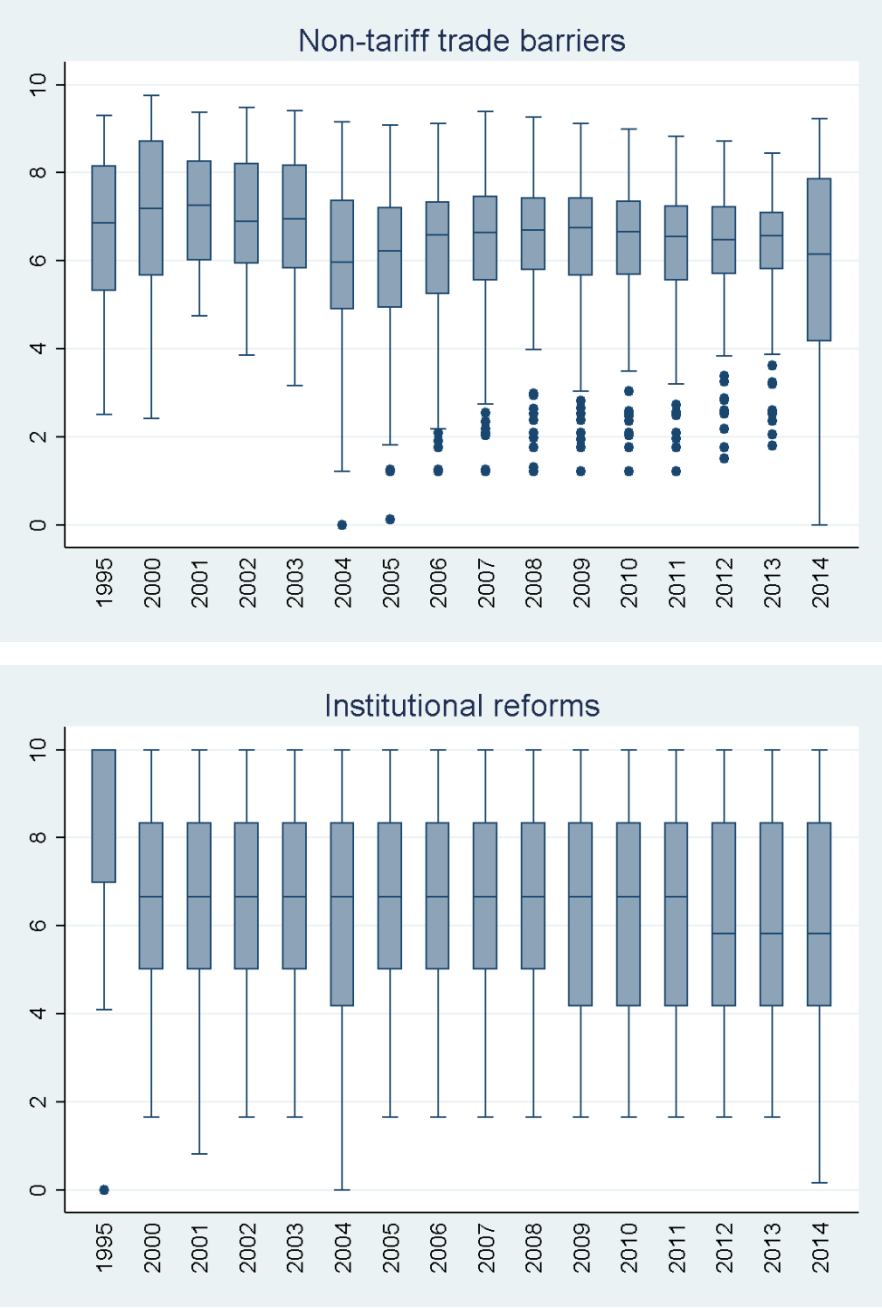


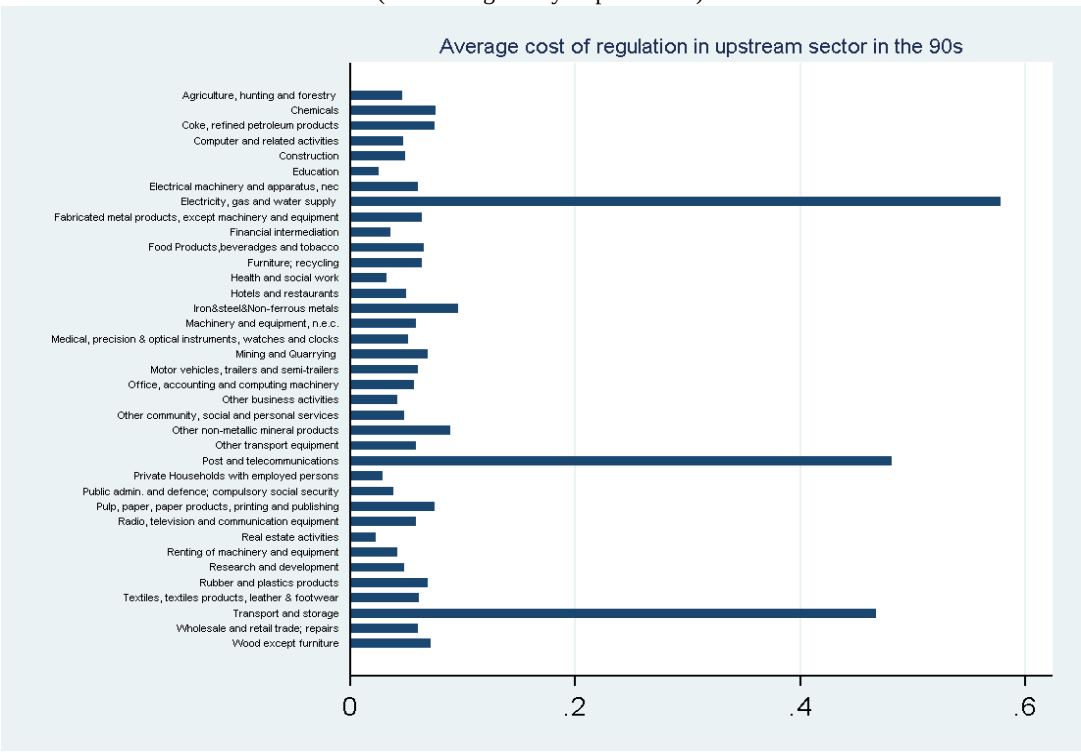
Figure 1. Structural Reform Indices (concluded)



Note: The box plots show the three quartiles of the distribution of the structural reform indices with their lower and upper adjacent values. The circles represent outliers. The labor market, trade, and institutional reform indices are standardized on a scale from 0 to 10, representing the distribution of the underlying data. The product market reform index quantifies the costs of anti-competitive regulation in upstream sectors (electricity, transportation, and communication) on 37 downstream sectors that use the output of these sectors as intermediate inputs.

Figure 2. Cost of Regulation in Upstream Sectors for Different Downstream Sectors

(OECD Regulatory Impact Index)



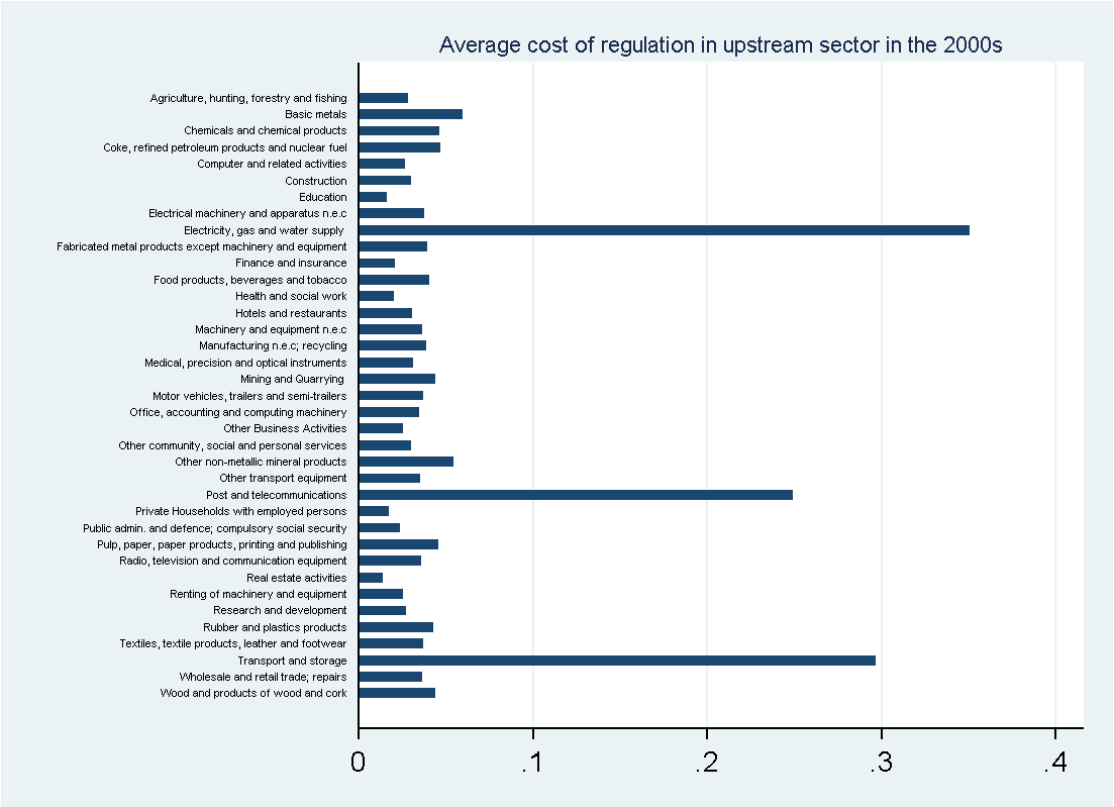


Figure 3. Effect of Structural Reforms on Output Growth

(baseline)

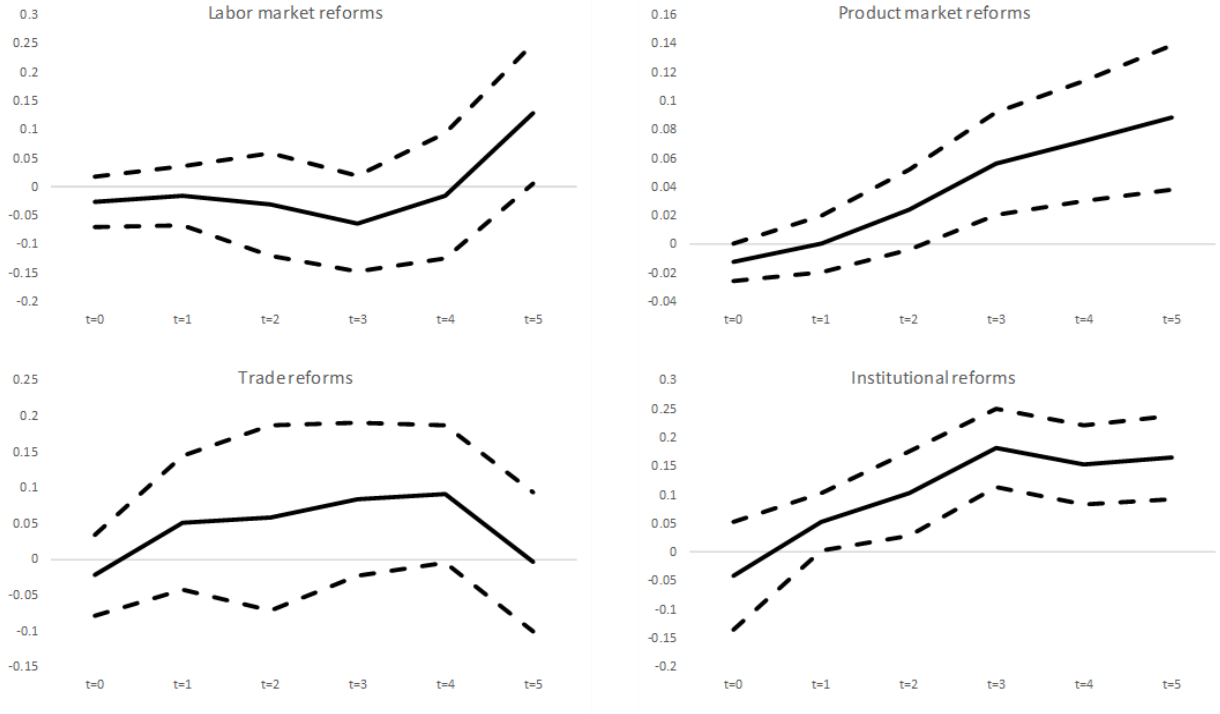
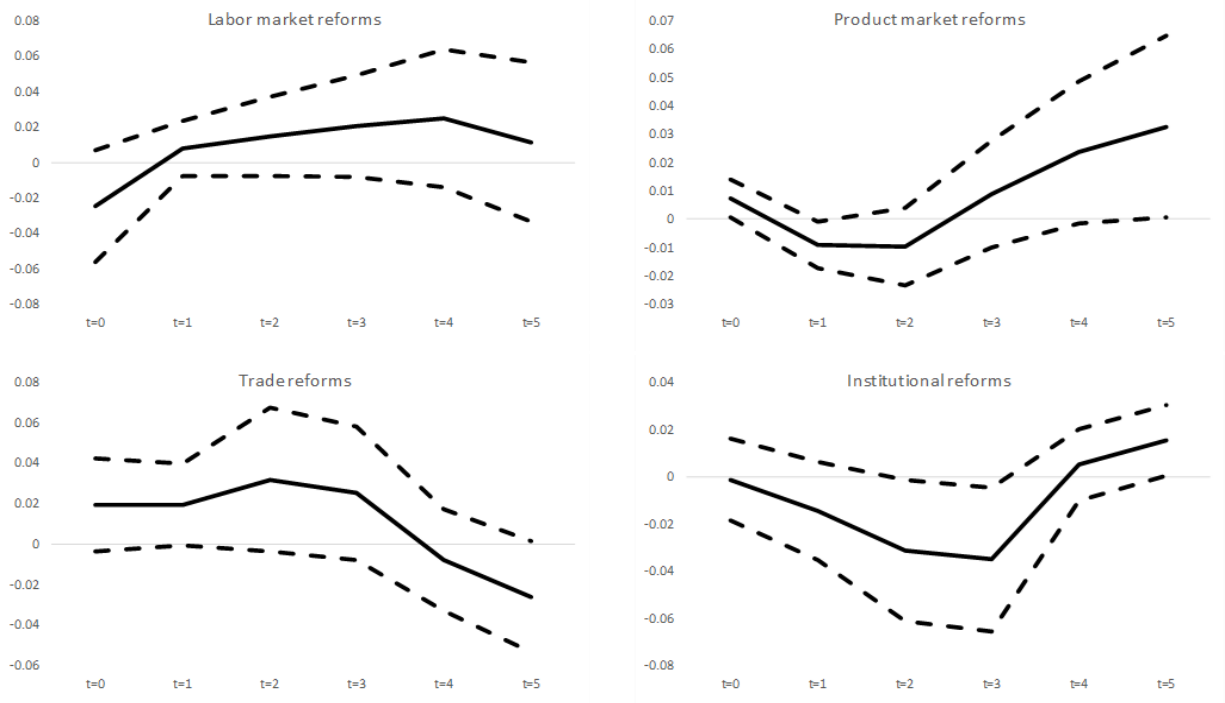


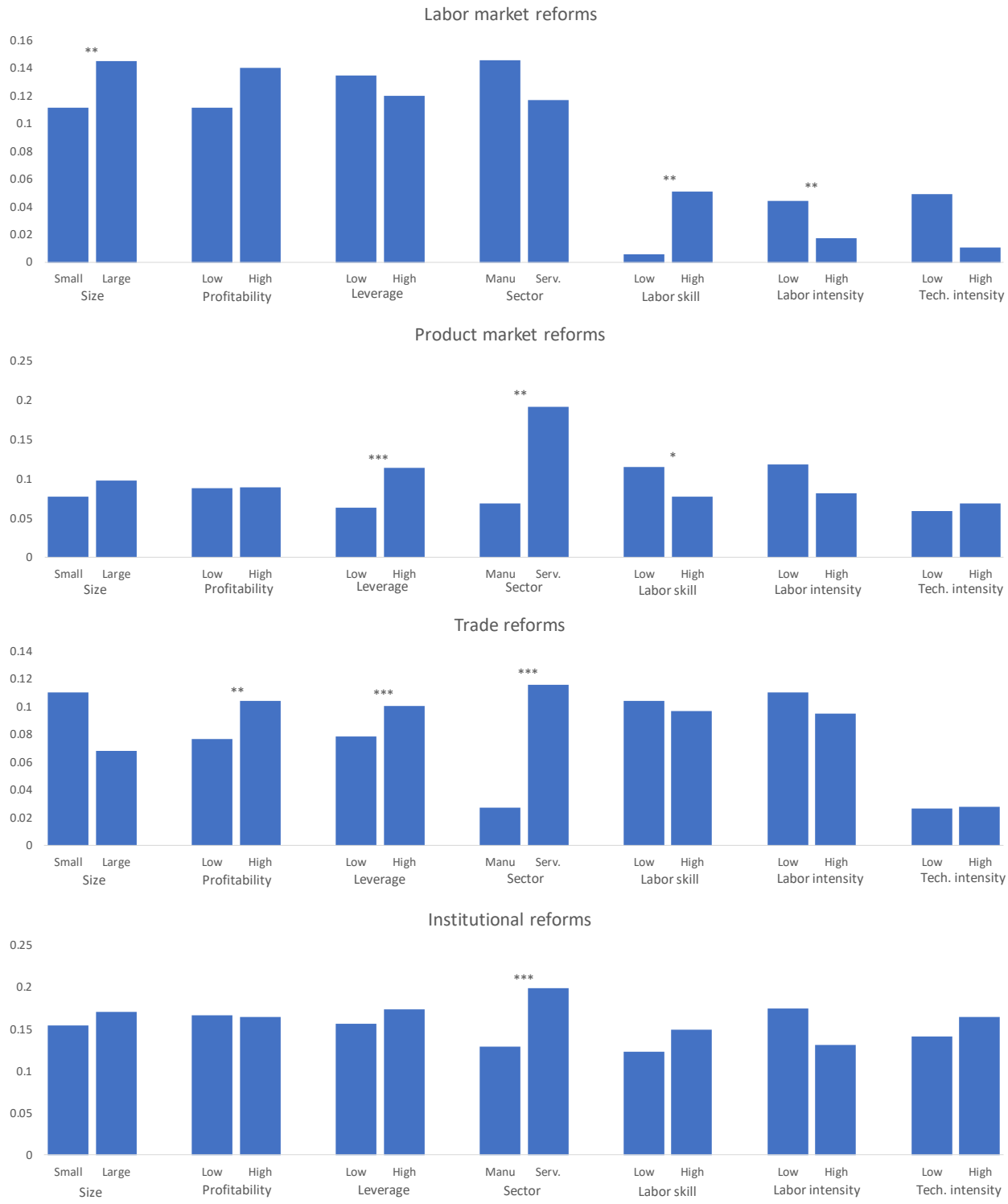
Figure 4. Effect of structural reforms on employment growth

(baseline)



Note: t=0 is the year of the shock. The solid lines denote the response to a major structural reform shock and the dashed lines denote the 90 percent confidence bands.

Figure 5. Effect of Structural Reforms by Firm Characteristics



Note: The bar charts show the coefficient size of the effect of structural reforms on output growth at t+5 for firms which are below or above the median of each firm characteristic. ***, **, * indicate whether the coefficients for firms below and above the median of each characteristic are significantly different from each other at a 10, 5, and 1 percent significance level, respectively.

Figure 6. Effect of Structural Reforms on Output Growth

(robustness check alternative shock identification)

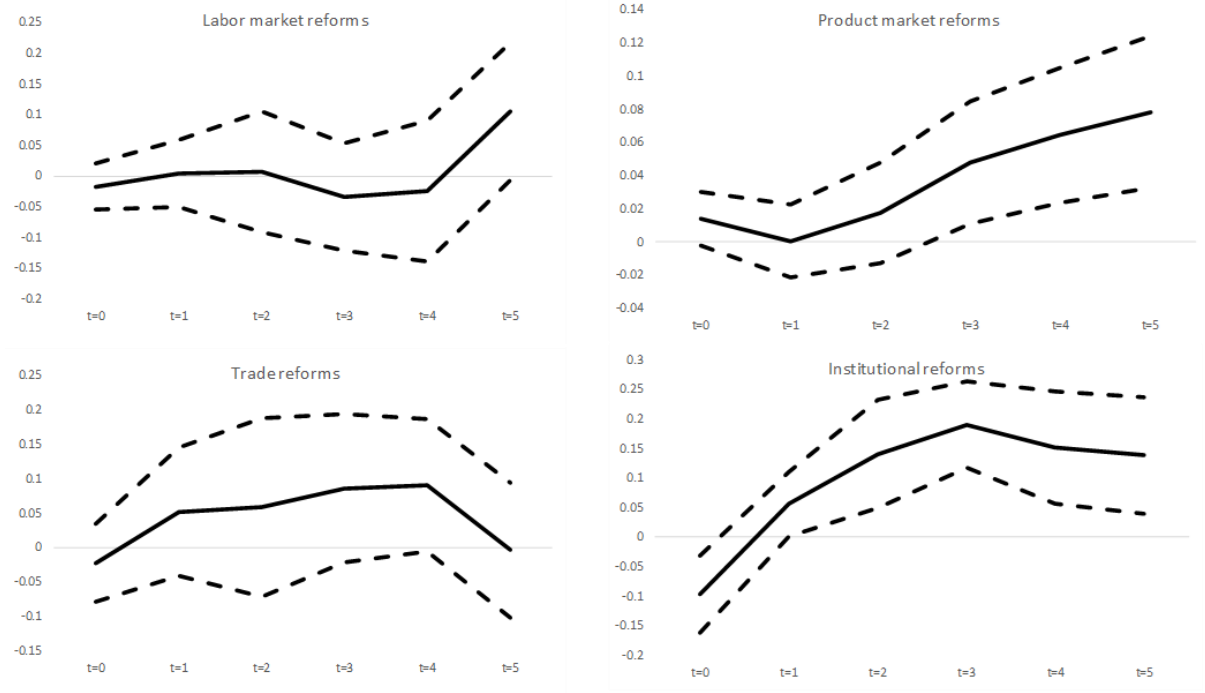
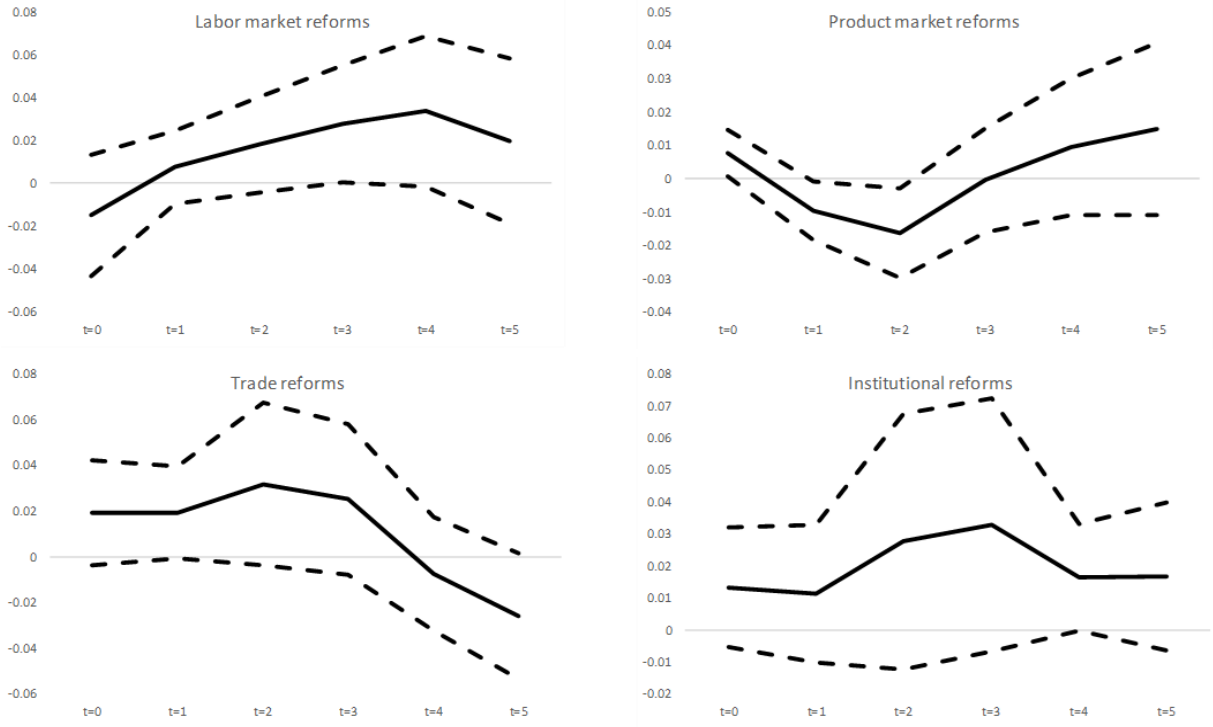


Figure 7. Effect of Structural Reforms on Employment Growth

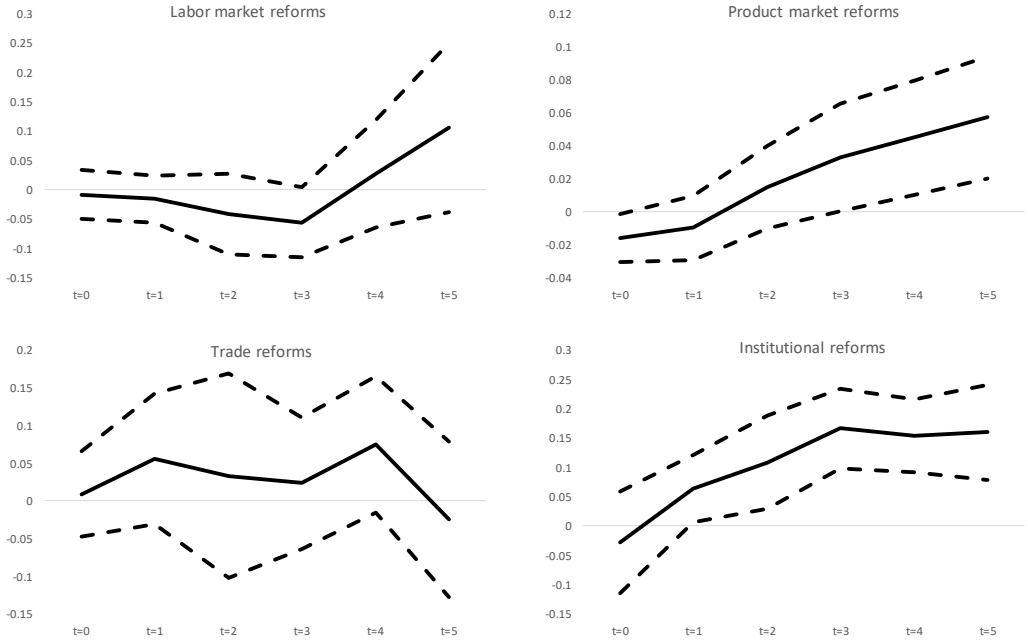
(robustness check alternative shock identification)



Note: t=0 is the year of the shock. The solid lines denote the response to a major structural reform shock and the dashed lines denote the 90 percent confidence bands.

Figure 8. Effect of Structural Reforms on Output Growth

(robustness check sectoral deflators)



Note: t=0 is the year of the shock. The solid lines denote the response to a major structural reform shock and the dashed lines denote the 90 percent confidence bands.

Figure 9. Effect of Structural Reforms on Output Growth

(robustness check richer set of fixed effects)

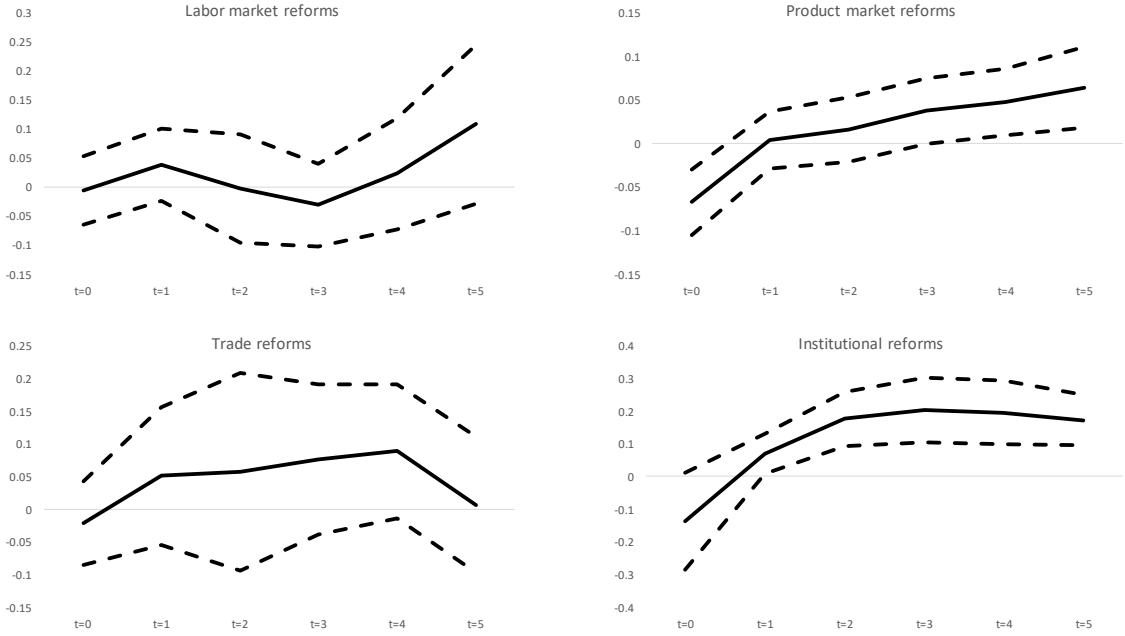
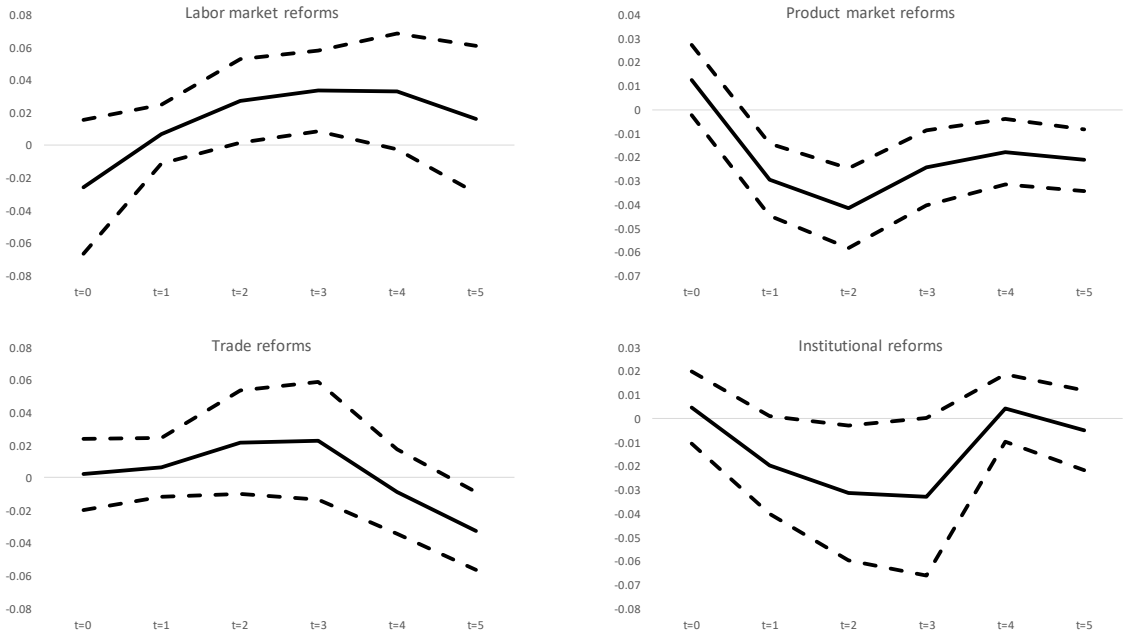


Figure 10. Effect of Structural Reforms on Employment Growth

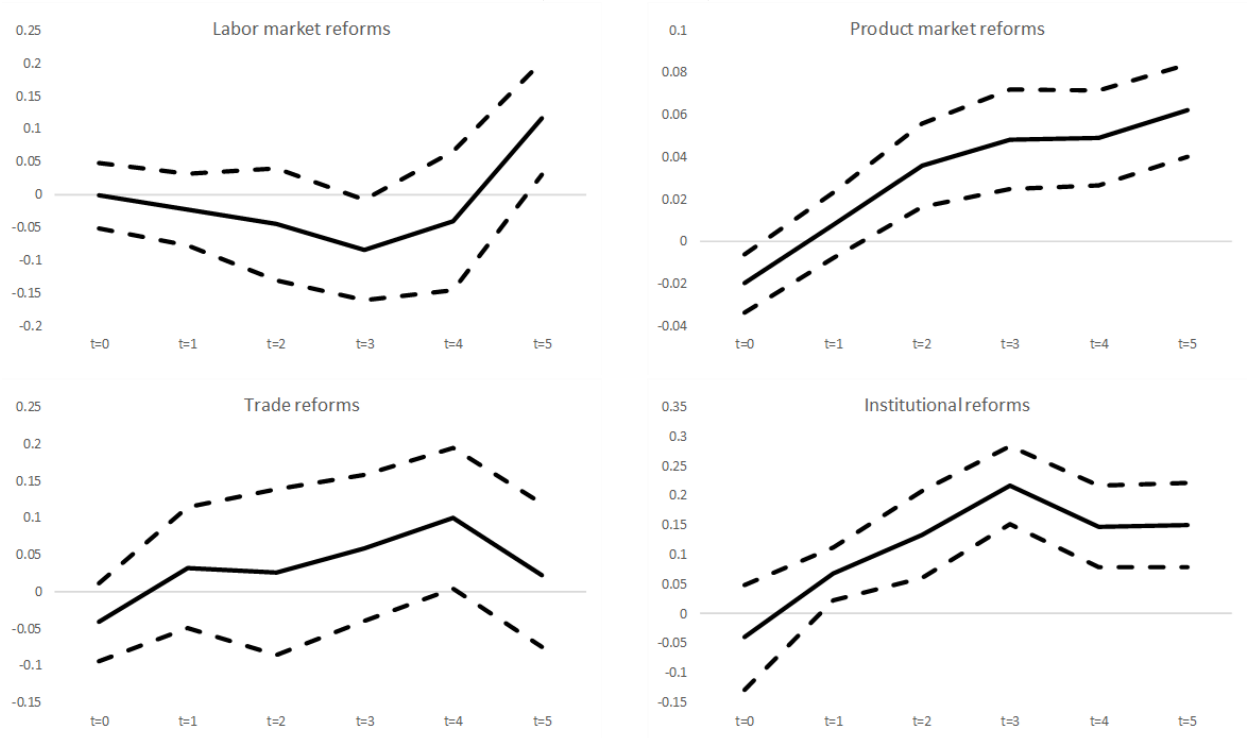
(robustness check richer set of fixed effects)



Note: t=0 is the year of the shock. The solid lines denote the response to a major structural reform shock and the dashed lines denote the 90 percent confidence bands.

Figure 11. Effect of Structural reforms on Labor Productivity Growth

(robustness check)



Note: t=0 is the year of the shock. The solid lines denote the response to a major structural reform shock and the dashed lines denote the 90 percent confidence bands.

Figure 12. Effect of Structural Reforms on Output Growth

(robustness check w/o predominant countries)

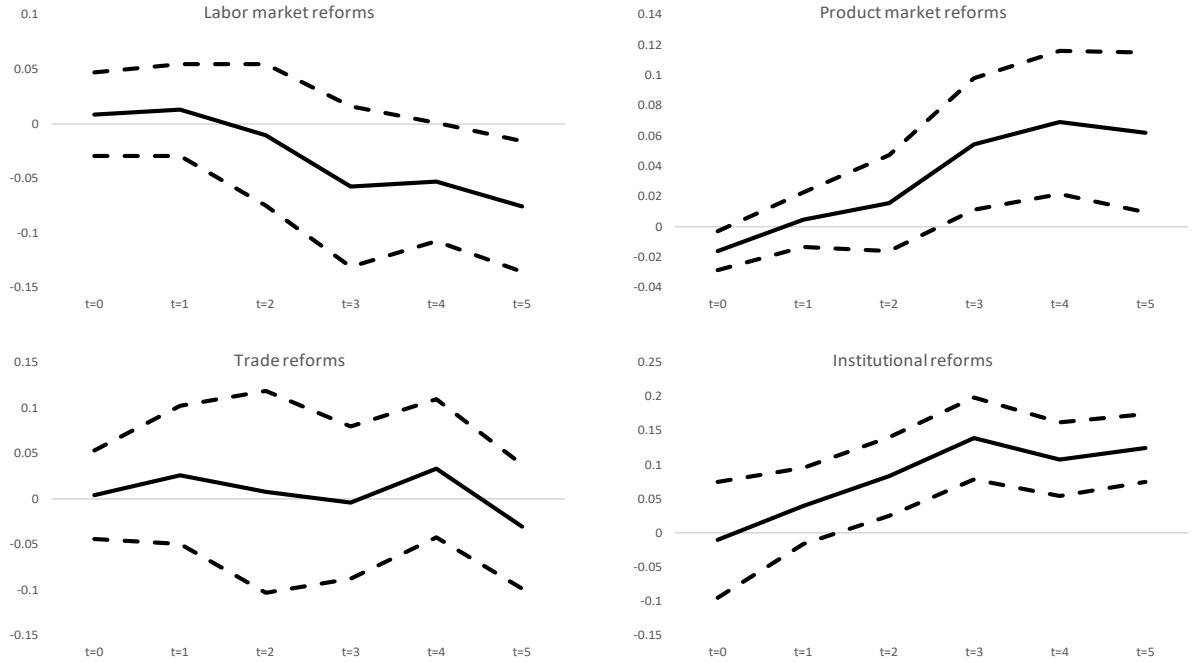
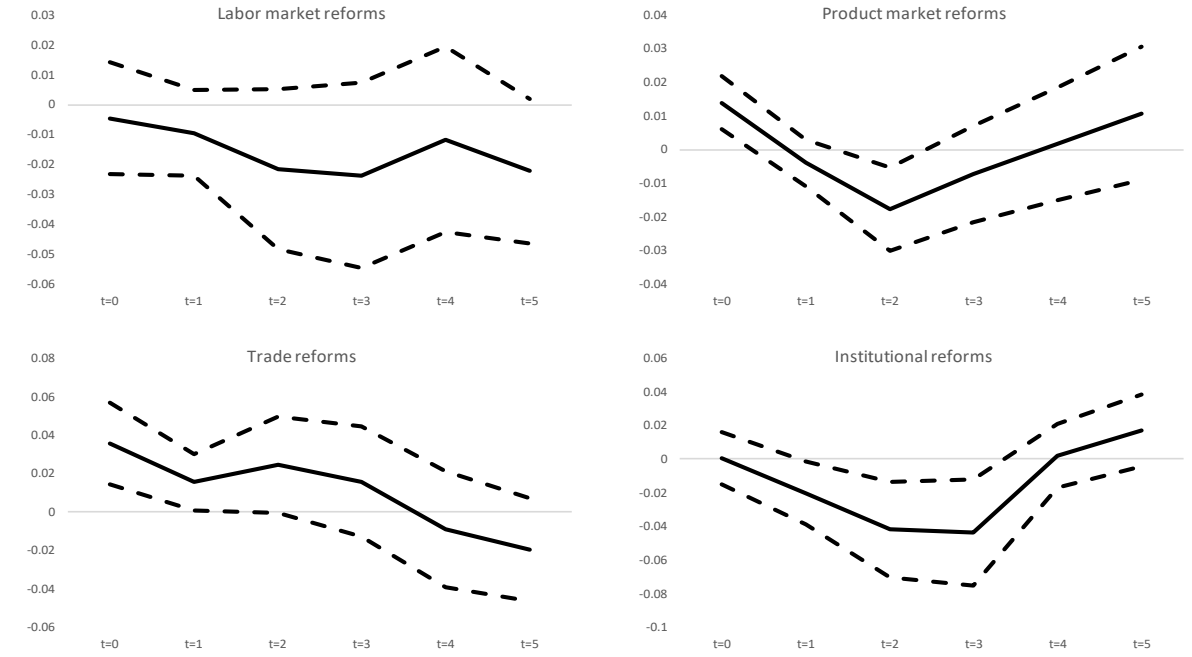


Figure 13. Effect of Structural Reforms on Employment Growth

(robustness check w/o predominant countries)



Note: t=0 is the year of the shock. The solid lines denote the response to a major structural reform shock and the dashed lines denote the 90 percent confidence bands.

Table 1. Reform Shocks by Country (2004–2009)

	Labor market	Product market *	Trade	Institutional
BEL	1 (2009)	2 (2005, 2006)		
BGR			1 (2006)	
BIH			1 (2006)	
CZE		2 (2005, 2006)		
DEU	1 (2009)	1 (2005)		
DNK		2 (2005, 2006)		
ESP		3 (2005, 2007, 2008)		
EST	1 (2009)	2 (2008, 2009)		
FIN	1 (2009)	1 (2006)		
FRA		2 (2005, 2006)	1 (2005)	
GBR	1 (2009)	1 (2008)		
GRC		2 (2005, 2007)		1 (2005)
HRV	1 (2009)		1 (2005)	
HUN	1 (2009)	1 (2007)		
IRL		1 (2007)		
ITA	1 (2009)	1 (2005)		1 (2005)
KOR		3 (2005, 2006, 2007)	1 (2006)	1 (2009)
POL	1 (2009)	1 (2005)		
ROU			1 (2005)	
SVK	1 (2009)	2 (2005, 2007)		
SVN		3 (2005, 2007, 2008)		
SWE	1 (2009)	2 (2005, 2009)		
Total	11	18	6	3
Incidence	6%	3%	3%	2%

*For product market reforms we show in how many years a reform shock was observed, but when calculating the incidence we divide all reform incidence per sector x country by all (sector x country x year) observations. The other indices have a country x year variation.

Table 2. Firm-level Data from Orbis. Firm-year Observations by Country

Countries	Freq.	Percent	Cum.
Belgium	53,723	1.27	1.27
Bosnia and Herzegovina	26,135	0.62	1.89
Bulgaria	57,805	1.37	3.26
China	32,414	0.77	4.03
Croatia	69,662	1.65	5.68
Czech Rep.	80,538	1.91	7.59
Denmark	14,469	0.34	7.93
Estonia	36,827	0.87	8.8
Finland	36,836	0.87	9.67
France	155,486	3.68	13.36
Germany	36,950	0.88	14.23
Greece	60,306	1.43	15.66
Hungary	18,750	0.44	16.1
Ireland	5,299	0.13	16.23
Italy	295,133	6.99	23.22
Japan	450,855	10.68	33.9
Korea, South	101,892	2.41	36.31
Latvia	9,609	0.23	36.54
Lithuania	11,713	0.28	36.81
Poland	34,457	0.82	37.63
Portugal	175,340	4.15	41.78
Romania	264,936	6.27	48.06
Russia	617,032	14.61	62.67
Serbia	55,568	1.32	63.99
Slovak Rep	32,169	0.76	64.75
Slovenia	23,680	0.56	65.31
Spain	721,526	17.09	82.4
Sweden	244,984	5.8	88.2
Ukraine	402,939	9.54	97.74
United Kingdom	95,270	2.26	100
Total	4,222,303	100	

Table 3. Effect of Structural Reforms

(robustness checks absolute change in the reform index)

	Output growth						Employment growth					
	t=0	t=1	t=2	t=3	t=4	t=5	t=0	t=1	t=2	t=3	t=4	t=5
Labor market reforms	-0.0167	0.0079	0.0040	-0.0053	0.0201	0.0104	0.0028	0.0024	0.0024	0.0050	0.0014	-0.0114
	0.0182	0.0207	0.0287	0.0257	0.0488	0.0376	0.0105	0.0056	0.0093	0.0093	0.0099	0.0114
Product market reforms	-0.6111***	0.2743	0.8351	1.1452**	1.5440**	1.4608**	0.2748***	-0.3274**	-0.4505**	-0.1174	0.1203	0.2131
	0.2283	0.3608	0.5804	0.5917	0.6601	0.7632	0.1004	0.1426	0.2145	0.2789	0.3277	0.3836
Trade reforms	0.0105	-0.1267	-0.1246	-0.0531	-0.0890	-0.0055	0.0030	-0.0115	-0.0014	0.0018	-0.0064	-0.0014
	0.0418	0.0817	0.0898	0.0760	0.0909	0.0659	0.0168	0.0150	0.0240	0.0211	0.0176	0.0193
Institutional reforms	-0.0413	0.0179	0.0684**	0.1145***	0.1024***	0.1135***	-0.0039	-0.0116	-0.0147	0.0038	0.0177**	0.0046
	0.0325	0.0302	0.0355	0.0367	0.0348	0.0321	0.0102	0.0110	0.0141	0.0165	0.0083	0.0075

Appendix A. Definition of Structural Reforms

Labor Market

We use the *mandated cost of worker dismissal* based on the World Bank's Doing Business report which gives a lower rating to countries with costly requirements for advanced notice, severance payments, and penalties due when dismissing a redundant worker.

Product market Reforms

We use the OECD indicators on regulatory impact (RI) which quantifies the potential costs of anti-competitive regulation in upstream sectors (electricity, transportation, and communication) on 37 downstream sectors that use the output of these sectors as intermediate inputs. The measures are available in 32 OECD and 2 non-OECD countries on an annual basis starting in 1975. The cost of regulation in downstream sectors are captured by the Energy, Transport, and Communication Regulation (ETCR) index which covers the degree of liberalization in the telecommunication and electricity markets, including the extent of competition in the provision of these services, the presence of an independent regulatory authority, and privatization.

Trade Regulations

We use the *regulatory trade barriers index* from the Fraser Institute which is an average of the *non-tariff trade barriers index* from the World Economic Forum's Global Competitiveness Report, the *compliance cost of importing and exporting index* from World Bank's Doing Business Report and the *black-market exchange rates index* from the MRI Bankers' Guide to Foreign Currency that gives high score to countries with a domestic currency that is fully convertible without restrictions.

Institutional reforms

Institutional reforms are measured by *the integrity of the legal system index* from the Fraser Institute Economic Freedom Index which is composed using the PRS Group's *International Country Risk Guide* measure of risk component. This risk component is an average of law and order, with the "law" sub-component measuring the strength and impartiality of the legal system and the "order" sub-component measuring the popular observance of the law.

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