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Productivity growth effects of structural reforms

Evidence from developing countries

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Abstract: Which structural reforms affect labour productivity growth in developing countries? This paper answers this question by combining the local projections method and the inverse probability weighted regression adjustment (LP-IPWRA) method. We find that financial reforms, trade reforms, and product market reforms boost labour productivity growth. By documenting the main channels, our results reveal that the reforms studied stimulate labour productivity growth by inducing dynamic efficiency, productive efficiency, and allocative efficiency. However, the results do not find statistical evidence of the ability of reforms to induce structural change. Further analysis taking into account the initial conditions reveals that the impact of reforms is not conditioned by the business cycle, the credit cycle, or whether or not a financial crisis occurs.

Key words: labour productivity, structural reform, local projection method, business cycle

JEL classification: D24, O16, O24, O47

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Note: As the research is part of the author's PhD thesis, they will hold copyright to facilitate its publication.

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1 Introduction

In both advanced and developing economies, a slowdown in productivity growth (Figure 1) was underway before the COVID-19 (coronavirus disease 2019) pandemic hit the world economy, raising fears that productivity would continue to decline (Dieppe 2021). One of the root causes of the 'working poor' phenomenon is low productivity. This is why, in order to promote long-term growth, Sustainable Development Goals 8.2 and 8.3 insist on the transformation of economies to promote high-productivity work. As productivity is the main driver of sustainable income growth and poverty reduction, there is an urgent need to reflect on the factors that can contribute to its revival.

Post-COVID-19 conditions must be driven by a combination of policies seeking to revive productivity growth. For this recovery to be successful, it is important that resources are allowed to flow to the most productive sectors/firms and those facing higher demand. In addition, economic measures are needed to limit increases in market power and thus promote competition between companies.

In the current political and health context, advancing structural reforms is of paramount importance to address declining productivity growth (IMF 2017). In limited policy space, to address concerns about weak economic growth, structural reforms could be a key part of the policy agenda in many developing countries.

What, then, are the structural policy options available to boost productivity in developing countries? Much empirical work has highlighted the productivity gains from structural reforms (Bertrand and Kramarz 2002; Fabrizio et al. 2007; Goolsbee and Syverson 2008; Schivardi and Viviano 2011; Dabla-Norris et al. 2015; E. Dabla-Norris et al. 2016; Bouis et al. 2016; Gal and Hijzen 2016; Arnold et al. 2016; Lanau and Topalova 2016).

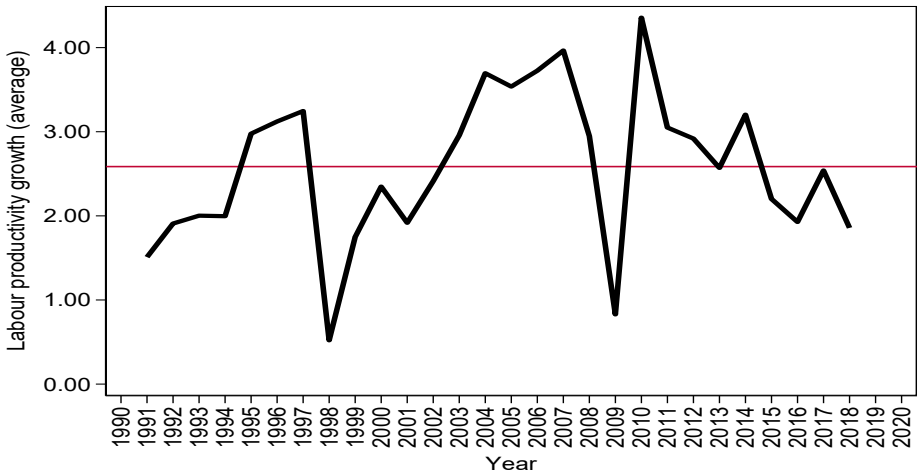
A common limitation of this work is the failure to identify the channels through which reforms stimulate productivity growth. Recently, the work of Konté et al. (2021) has addressed this issue by analysing the impact of structural reforms on labour productivity growth while documenting the main channels of reform. Over a period from 1973–2005 and considering 36 developing countries, the authors find that structural reforms stimulate labour productivity growth. They find that structural reforms work mainly through the intra-allocation efficiency channel but not through the interallocation efficiency channel. However, their study has a number of limitations. First, the time dimension does not take into account recent developments in the reforms implemented in many developing countries. Second, in macroeconomics, estimating the impact of structural reforms on any economic outcome is a difficult task (Nakamura and Steinsson 2018). Structural reforms are not exogenous and are not randomized across countries. Moreover, the economic effects of structural reforms may depend on the initial economic conditions prevailing at the time of their implementation.

This study makes several contributions to the empirical literature and policy debates on the economic effects of reforms. To more robustly assess the link between reforms and labour productivity, this paper proposes the use of sophisticated estimation techniques. Thus, to estimate the dynamic effects of structural reforms while controlling for their endogenous character, the article combines the local projections method and the inverse probability weighted regression adjustment (LP-IPWRA) method by Jordà and Taylor (2016). The IPWRA method makes it possible to estimate the treatment effects of structural reforms while controlling for potential selection bias. One of its important features is its double robustness; i.e. the estimator remains consistent even if one of the models (treatment or outcome) is misspecified. Thus, our study differs from that of Konté et al. (2021) in several respects. First, our study uses recent data on structural reforms constructed by Alesina et al. (2020). Second, our study focuses on the dynamics of labour productivity growth around large episodes or upheavals in structural reforms. Reform shocks are less likely to be systematically correlated with other variables that could affect labour

productivity growth. This approach is less likely to face the endogeneity problem. Finally, our methodological approach based on local projections and propensity score inversion methods not only allows us to produce robust estimates but also to take into account the nonlinearities of the relationship between productivity and reforms.

In this study, we examine three key structural reforms as factors contributing to labour productivity improvements in developing countries: financial, trade, and product market reforms. The links between reforms and productivity are indirect and often operate through specific channels, notably through structural change and/or the efficient allocation of resources such as labour.

Figure 1: World labour productivity growth average over time, 1990–2019



Source: Authors' calculations

Note: the red line represents average productivity growth over 1990–2008.

Source: author's calculations (Conference Board Total Economy Database).

In a market economy, the financial sector plays an important role in terms of resource allocation. The proper functioning of the financial system allows a better allocation of (scarce) resources so that resources can move from low productivity sectors to high productivity sectors and lead the real sectors on the path to growth (Schumpeter 1934). A more efficient financial system can increase the level of investment by stimulating innovation while allowing countries to benefit from technology transfer (Levine 2005). Empirically, work has shown that the development of capital markets stimulates productivity growth. By encouraging reforms based on the formation and development of bond and securities markets, countries can increase their productivity by lowering the cost of capital (Dabla-Norris et al. 2015).

Second, countries could benefit from productivity gains from trade reforms. It has been shown empirically that trade reforms improve total productivity growth (Melitz 2003). This is the case, for example, of the study by Melitz and Ottaviano (2008), which finds that trade reforms increase competition while leading to a reallocation of resources from less productive to more productive firms. By removing barriers to international trade and foreign direct investment, countries can take advantage of a better allocation of resources and technology transfer, which would allow them to improve their level of productivity.

Finally, product market reforms (sector reforms and liberalization of the telecommunications and electricity markets) can stimulate productivity growth. The removal of regulations that restrict product market entry can create competition between firms facilitating the entry of new high-tech firms, which will improve productivity growth. Thus, liberalization of product markets could facilitate the monitor-

ing of firms and encourage managers or public enterprises to improve their allocative and productive efficiency.

The rest of the paper is structured as follows: Section 2 describes data on the structural reforms and labour productivity; Section 3 describes the estimation method; Section 4 presents the basic results; Section 5 presents robustness analyses; and Section 6 concludes.

2 Data description

2.1 Structural reform data

In this study, we consider market-oriented reforms or supply-side policies that aim to liberalize certain markets in developing countries. We use reform indicators constructed by Alesina et al. (2020). These data have the advantage of covering a large number of countries (90 countries, including 68 emerging and developing economies, EMDEs) over the period 1973–2014. The study focuses on 35 developing countries over the period from 1990 to 2014. [1]

The analysis covers reforms implemented in three different sectors: trade, financial, and market and product reforms. (i) Financial reforms are an aggregate of two sub-indicators (domestic finance and external finance). (ii) Trade reforms are based on average tariff levels and an index on current account transactions. (iii) Product market denotes the index that considers liberalization and regulation in two network sectors (telecommunications and electricity) covering three broad areas (privatization, entry barriers, and supervision and regulation).[2] All reform indicators are normalized between 0 and 1. We construct an aggregate reform index by summing the indices of different structural reforms (financial, product market, and trade reforms) and normalizing the values between 0 and 1.

2.2 Labour productivity data

The labour productivity data are sectoral data (12 sectors) and are derived from the GGDC/UNU-WIDER Economic Transformation Database. This database provides information on persons employed and value added. We measure labour productivity in terms of value added per worker over the period covered by the structural reforms, which has the advantage of being dynamic.

Labour productivity growth can be decomposed into two components: first, productivity growth resulting from intrasectoral productivity growth (within) and, second, that resulting from an intersectoral reallocation of labour (between or structural change). We use the decomposition methodology à la McMillan and Harttgen (2014) by decomposing the cumulative changes in total labour productivity between time t and time $t + h$ according to the following equation:

$$LPG_{i,t+h} - LPG_{i,t-1} = \sum_{j=1}^{12} (LPG^{j}_{i,t+h} - LPG^{j}_{i,t-1}) * s^{j}_{i,t-1} + \sum_{j=1}^{12} (s^{j}_{i,t+h} - s^{j}_{i,t-1}) * LPG^{j}_{i,t+h} \qquad (1)$$

where $LPG_{i,t}$ is the aggregate labour productivity in country i at time t, $LPG^{j}_{i,t}$ is the labour productivity of sector j in country i at time t. The first component of equation (1) on the right describes the average intrasector productivity growth. Intrasectoral productivity occurs when firms in the sector adopt new

[1] The sample size as well as the period of study depend on the availability of sectoral labour data.

[2] For a detailed description of the structural reform indicators considered in this analysis, readers are referred to the article by Alesina et al. (2020).

practices by changing their production functions to adopt new technologies. The adoption of new technology leads to an increase in value added per worker in the firm without a change in the employment of the workforce. The second component (between or structural change) of equation (1) describes the productivity growth due to the movement of labour from low- to high-productivity sectors.

3 Empirical methodology

Structural reforms can generate productivity gains with a time lag and possibly short-term costs. To account for the dynamics of the impact of structural reforms, we estimate the cumulative responses of labour productivity growth (and its components) over a five-year time horizon following a structural reform shock. We use the method of impulse responses from Jordà (2005). This approach is suitable for misspecification and the estimation of nonlinearities in the dynamic response—in this case, the interactions between structural reform shocks and macroeconomic conditions and policies. Our basic specification is the following:

$$\Delta y_{i,t+h} = \alpha_i^h + \gamma_t^h + \beta^h D_{i,t+1} + \theta^h X_{i,t-1} + \varepsilon_{i,t+h} \tag{2}$$

where $\Delta y_{i,t+h} = \frac{y_{i,t+h} - y_{i,t-1}}{y_{i,t-1}}$ denotes the cumulative change of the labour productivity growth between $t-1$ and $t+h$ of country i. $h \in [1,5]$ is the time horizon. $D_{i,t+1}$ is the reform shock measured as a dummy according to the definitions of the structural reforms shock described below (see Section 3.2). We assume that reforms shocks can contemporaneously affect labour productivity growth, given that our frequency is yearly, and hence, policy decisions made at time t will start to be effective between year t and year $t+1$. $X_{i,t-1}$ is a set of control variables that includes lagged values of the dependent variable, annual GDP growth, and unemployment rate. We also control for time (α_i^h) and country (α_i^h) fixed effects to capture common shocks and time-invariant country features, respectively. $\varepsilon_{i,t+k}$ is a residual term.

3.1 Inverse probability weighted regression adjustment estimator

The occurrence of structural reforms may not be random, and the nonexogeneity of reform could potentially bias the results obtained by the local projection method. There are several reasons why it is difficult to estimate the impact of structural reforms empirically. First, the impact of a reform implemented shortly before a cyclical upturn is difficult to distinguish from the upturn itself, which could lead to an upwards bias in the estimation of the impact of the reform. Conversely, if the reform is implemented at the beginning of a recession, this could create a downwards bias in the estimate. Second, the magnitude of the impact of structural reforms depends on the business cycle itself. For example, a reform launched during a recession could add uncertainty due to the legal clarification needed, leading to small or even negative effects.

Finally, while the state of the business cycle could affect the likelihood of implementing structural reforms, it could also trigger a macroeconomic policy response. Macroeconomic policies (fiscal or monetary policies) that support demand can increase the positive effects of reforms on macroeconomic outcomes (Bordon et al. 2018).

For the remainder of our study, we focus on reform shocks identified by significant changes in the structural reform indices (see the section below). This approach has the advantage of not focusing on the level of the reform index but, rather, on significant changes in the index that have impacts on productivity. This new definition of reforms is less likely to be plagued by endogeneity problems (E. Dabla-Norris et al. 2016).

To properly identify the causal impact of structural reforms on productivity, we compare countries that have experienced a large change in the structural reform indicator to countries that have not experienced a large change. Regardless of the identified reform shocks, the decision to reform or not may be strongly related to macroeconomic and political variables. Indeed, for some countries, political factors may play a role and have an impact on, among other things, the effectiveness of a reform undertaken. Moreover, some countries may be more or less able to accompany structural reforms in times of crisis with macroeconomic measures to support demand [see, e.g., Bordon et al. (2018)]. This, then, creates differences between countries that have experienced a significant change in the reform indicator and countries that have not, conditioned on observable characteristics, leading to a selection or allocation bias. In such a context, the causal effects identified may include other aspects beyond the impact of structural reforms.

To estimate the impact of reform shocks on productivity, we combine the local projection approach with the inverse probability weighted regression adjustment (IPWRA) method.[3] By combining a treatment model and a regression model, the IPWRA model simultaneously takes into account the observed confounders that explain the exposure to the treatment (countries that experienced a significant change in the reform indicator) and the unobservables that are correlated with the outcomes (labour productivity). Our strategy for estimating the effect of reforms is based on three steps.

First, we estimate a propensity score that describes the probability that a country experiences a large change in the reform indicator conditional on observable characteristics:

$$\hat{p_{i,t}} = Pr(D_{i,t} = 1|X_{i,t}) = \Gamma(X, \theta) \tag{3}$$

where $\hat{p_{i,t}}$ is the propensity score estimated, and $X_{i,t}$ is a vector of policy and macroeconomic factors. Γ and θ represent probit distribution function and estimated coefficients, respectively.

Explicitly, we estimate a probit model to obtain these propensity scores using the fitted value of the regression according to the equation below:

$$D^*_{i,t} = \theta + \lambda X_{i,t} + \mu_{i,t} \tag{4}$$

where $D^*_{i,t}$ is the underlying continuous latent variable for the observed treatment variable. The observed variable $D_{i,t}$ is a realization of a reform shock when the latent variable is positive:[4]

$$D_{i,t} = \begin{cases} 1 & if D^*_{i,t} > 0 \\ 0 & \text{otherwise.} \end{cases} \tag{5}$$

The second step is to re-randomize our sample through inverse weighting of the propensity score. Inverse weighting reduces the weight of countries that were likely to experience a large change in the reform indicator and increases the weight of those that were unlikely to observe a large change in the reform indicator, conditional on observable characteristics. With this process, countries that had a significant change in the reform indicator and not in the reform indicator are made comparable as they would have the same chance of being treated if the treatment had not actually been carried out.

[3] This identification approach is new and has been powerful in macroeconomic analysis in recent years (Jordà and Taylor 2016).

[4] $D_{i,t}$ can be interpreted as the probability of occurrence of reform shocks (or episodes) (see Section 3.2 for the definition of a reform shock).

After obtaining a more balanced sample, we use a regression model, the local projection model, to project the outcome variables (at each horizon $h \in [1,5]$) in the treatment group and the control group (countries that did not experience a large change in the reform indicator) onto a number of determinants in order to obtain conditional means.

Finally, the third step is to calculate a specific average treatment effect using the IPWRA estimator:

$$\hat{\Lambda}^{h}_{IPWRA} = \frac{1}{n^{*}_{1}} \sum [\frac{D_{i,t} m^{h}_{1}(X_{i,t}, \hat{\eta}^{h}_{1})}{\hat{p_{i,t}}}] - \frac{1}{n^{*}_{0}} \sum [\frac{(1-D_{i,t}) m^{h}_{0}(X_{i,t}, \hat{\eta}^{h}_{0})}{1-\hat{p}_{i,t}}] \tag{6}$$

where $m^{h}_{1}(.,.)$ defines the conditional mean of $\Delta y_{i,t+h}$ for the treatment group ($j = 1$) and the control group ($j = 0$). Specific parameters are represented by $\hat{\eta}^{h}_{j}$.

The IPWRA estimator is said to be doubly robust in that it offers protection against possible specification error (Imbens 2004; Lunceford and Davidian 2004; Wooldridge 2007, 2010). It produces robust results when at least one of the two models (treatment model or regression adjustment model) is correctly specified.

3.2 Structural reform shock identification

The literature on the economic effects of structural reforms on economic performance uses four approaches to identify structural reform shocks: (i) a filter-based approach [see, e.g., Pattillo and Gupta (2005); Hausmann et al. (2005, 2006); Libman et al. (2019)], (ii) a statistical approach to structural breaks [see, e.g., Kerekes (2007); Berg et al. (2012)], (iii) a combination of the previous two approaches [see, e.g., Kar et al. (2013)], and (iv) the use of standard deviation (a reform shock is considered to be one that exceeds two standard deviations of the variation in the indicator over all observations). Each of the first three approaches to identifying structural reform shocks has important limitations (Kar et al. 2013).[5]

First, in the filter-based approach, the nature of the filters is ad hoc and predetermined by the researcher, which leads to a lack of consistency in the identification of breaks. Second, the statistical approaches, i.e. those of Bai and Perron (1998, 2003), are limited by the low power, leading to the rejection of the true breaks suggested by the behaviour of the underlying series of structural reforms. The Bai and Perron (1998) approach is not able to identify true breaks in the structural reform index, especially for countries where the reform series is very volatile. This is the so-called 'true negative' problem. Third, Kar et al. (2013) proposed a combination of the two approaches. This approach involves the best fit of the Bai and Perron method to the data to select the candidate breaks, followed by the application of the filter to these breaks to identify the true breaks. The combination of the two approaches also has limitations, i.e. being ad hoc and not being able to identify true breaks (since they result from the application of the same criteria). Fourth, the identification of structural reform shocks can be based on the use of the standard deviation, defined as a reform shock if the reform exceeds two standard deviations of the variation of the reform indicator over all observations. Here again, there is a threshold predetermined by the researcher without any statistical basis.

Given these limitations of the methods commonly used in the literature, our approach is to identify structural reform shocks as a large change in the reforms index. We follow the recent work of Gokmen et al. (2021). We define a reform shock as a dummy variable taking the value 1 when there is a large

[5] These are approaches that are often used in the literature on economic growth spells. Aee, e.g., Kerekes (2007), Berg et al. (2012), and Arizala et al. (2017).

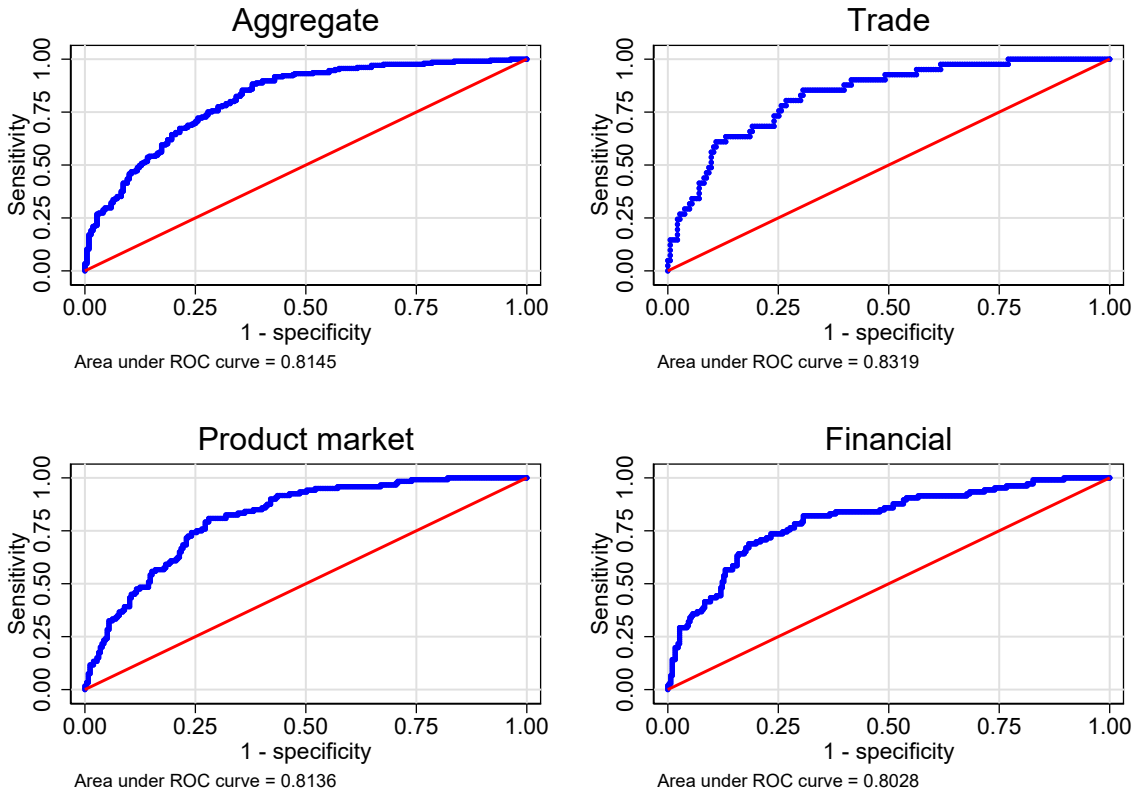
positive change in the reform index variable and 0 otherwise. A large change is defined as a change in the reform variable greater than 5 per cent. The change in the reform index is defined relative to the average value of the reform index in the last three-year window. Figure A1 in the Appendix shows the average number of reform and reversal shocks per year.

$$Reform\_shock = \begin{cases} 1 & \text{if } \Delta\textbf{Reform}>5\%,\ \Delta\textbf{=t-mean[(t-1),(t-2),(t-3)]} \\ 0 & \text{otherwise} \end{cases} \tag{7}$$

4 Results

Through probit specifications, we estimate the first-stage equations, i.e. the propensity scores for each of the structural reform episodes. In other words, we estimate the probability that a country has a significant change in the reform indicator considered. The results are presented in Table A2 in the Appendix for each reform index.

Figure 2: ROC curves for predicting large change in different reforms



Source: author's illustration based on study data.

To ensure the predictive capacity of the model, an indicator commonly used in biostatistics and machine learning is the area under the ROC curve (AUC) (Jordà and Taylor 2016). We summarize the results obtained through a graphical representation (Figure 2). The ROC curve plots the true-positive rate on the y-axis and the false-positive rate on the x-axis for each level of probability. When the AUC is 0.5, this implies that the covariates have no classification ability. On the other hand, covariates have perfect classification ability if the AUC is unity. In Figure 2, the AUC statistics show that the estimated probit models have very good predictive ability, with AUC ranging from 0.80 to 0.83. The results illustrate that

reform decisions are not random but are endogenous to several factors. To do this, we re-randomize the treatment allocation conditional on the observed variables after weighing the sample by the inverse of the estimated propensity scores.

After re-randomizing our sample through inverse propensity score weighting, we estimate the average treatment effect and consider a time horizon of 5 years for the local projection impulse response. Table 1 presents the results of the effect of structural reforms on the cumulative variation of the growth rate of labour productivity over a time horizon ranging from 1 to 5 years. To take account of correlations in the error terms, we calculate robust standard deviations obtained through the Driscoll and Kraay (1998) method.

For the aggregate reforms as well as the trade and product market reforms, the estimated effects are positive but not significant from the first year after the implementation of the reform until the third year. The estimated effects become significant only from the fourth year onward. For example, the aggregate reforms, by year 5, increase the labour productivity growth rate by 1.20 percentage points. However, the estimated effect of financial reforms is immediately positive and significant in the year following the implementation of the reform until the fifth year. These results are consistent with empirical studies. They confirm the idea that the benefits resulting from structural reforms depend on the type of reforms as well as the period through which the effect is estimated. In other words, the positive impact of reforms on productivity growth is felt in the medium term and not in the short term.

Table 1: ATE of structural reforms on labour productivity growth

	(1)	(2)	(3)	(4)	(5)
	year(t+1)	year(t+2)	year(t+3)	year(t+4)	year(t+5)
ATE u wts: Aggregate reforms	0.58	0.76	1.34**	1.36***	1.20**
	(0.38)	(0.64)	(0.58)	(0.29)	(0.42)
Observations	419	419	419	419	419
ATE u wts: Trade reforms	2.65	2.90**	2.94**	1.32	2.32***
	(1.66)	(1.04)	(1.21)	(0.80)	(0.53)
Observations	419	419	419	419	419
ATE u wts: Financial reforms	0.67	1.19**	1.19*	1.28**	0.95**
	(0.52)	(0.45)	(0.64)	(0.51)	(0.39)
Observations	419	419	419	419	419
ATE u wts: Product market reforms	-0.75	-0.69	0.27	1.12*	0.82*
	(0.46)	(0.71)	(0.89)	(0.58)	(0.40)
Observations	419	419	419	419	419

Note: Driscoll-Kraay standard errors in parentheses. *** p≤0.01, ** p≤0.05, * p≤0.1. Additional controls: 2 lag of unemployment, total (% of total labour force); 1 lag of dependent variable; dummy variable for year of a banking, currency, inflation, or debt crisis from Laeven and Valencia (2020); country and year fixed effects are also included. Propensity score is based on the probit model as described in the text and includes: GDP growth (annual %); ICRG indicator of quality of government; unemployment, total (% of total labour force); IMF programme; commodity terms of trade; legislative election dummy; age dependency ratio. All variables are in lag. IPWRA estimates do not impose restrictions on the weights of the propensity score.

Source: author's calculations based on study data.

4.1 Intra- or Inter-reallocation channels?

In this section, we examine the empirical effects of structural reforms on the within and between components of labour productivity. The study of the links between reforms and productivity components allows us to determine whether reforms affect productivity growth by inducing an efficient reallocation of resources between sectors, within sectors, or both (Furceri et al. 2021; Konté et al. 2021). To our knowledge, these channels have not received much attention in the literature on the effects of reforms on productivity.

We present the results of the linkages between structural reforms and the labour productivity growth component in Table 2.

Table 2: Average treatment effect of structural reforms on within and between components

	(1) year(t+1)	(2) year(t+2)	(3) year(t+3)	(4) year(t+4)	(5) year(t+5)
Within [Panel A]					
ATE u wts: Aggregate reforms	1.46***	1.28*	1.78***	1.51***	0.89***
	(0.44)	(0.70)	(0.48)	(0.20)	(0.28)
Observations	419	419	419	419	419
ATE u wts: Trade reforms	2.43	3.02***	3.14**	1.19	2.20***
	(1.59)	(1.04)	(1.25)	(0.77)	(0.34)
Observations	419	419	419	419	419
ATE u wts: Financial reforms	1.09***	1.93***	1.52***	1.27***	1.00**
	(0.36)	(0.40)	(0.46)	(0.35)	(0.38)
Observations	419	419	419	419	419
ATE u wts: Product market reforms	-0.14	-0.36	1.00	1.14*	0.55*
	(0.41)	(0.75)	(0.80)	(0.62)	(0.29)
Observations	419	419	419	419	419
Structural change [Panel B]					
ATE u wts: Aggregate reforms	-0.85***	-0.48**	-0.41	-0.13	0.31
	(0.23)	(0.20)	(0.32)	(0.15)	(0.20)
Observations	419	419	419	419	419
ATE u wts: Trade reforms	0.20	-0.14	-0.23	0.12	0.10
	(0.40)	(0.49)	(0.42)	(0.41)	(0.45)
Observations	419	419	419	419	419
ATE u wts: Financial reforms	-0.42	-0.73**	-0.33	0.01	-0.04
	(0.36)	(0.28)	(0.45)	(0.46)	(0.35)
Observations	419	419	419	419	419
ATE u wts: Product market reforms	-0.52	-0.23	-0.64**	0.04	0.31
	(0.40)	(0.28)	(0.23)	(0.26)	(0.30)
Observations	419	419	419	419	419

Note: Driscoll-Kraay standard errors in parentheses. *** p≤0.01, ** p≤0.05, * p≤0.1. Additional controls: 2 lag of unemployment, total (% of total labour force); 1 lag of dependent variable; dummy variable for year of a banking, currency, inflation, or debt crisis from Laeven and Valencia (2020); country and year fixed effects are also included. Propensity score is based on the probit model as described in the text and includes: GDP growth (annual %); ICRG indicator of quality of government; unemployment, total (% of total labour force); IMF programme; commodity terms of trade; legislative election dummy; age dependency ratio. All variables are in lag. IPWRA estimates do not impose restrictions on the weights of the propensity score.

Source: author's calculations based on study data.

In Panel A, we present the impact of the reforms on the within component and in Panel B the impact of the reforms on the between component. Overall, the results show a statistically significant positive impact of structural reforms on the within component. It should be noted, however, that, depending on the type of reform, the impact is not immediate and takes time to materialize. This is the case with product and trade market reforms. Unlike the within component, the results show little statistical evidence on the effect of structural reforms on structural change. In summary, these results lead to the

conclusion that the reforms stimulate the growth of labour productivity in the countries studied mainly through dynamic, productive, and allocative efficiency.

5 Robustness checks

This section focuses on a robustness analysis of the results taking into account the initial conditions as well as the exclusion of diversified economies.

5.1 Excluding diversified economies

We conduct robustness analyses by excluding diversified economies in our sample. Our baseline results may be sensitive to economic diversification, considering that economic diversification is important as resource-rich countries generally rely on a single industry as their main source of revenue. At the same time, diversified economies have a number of different sources of income that provide countries with the capacity for sustainable growth due to their lack of dependence on a single source of income. In addition, more diversified economies are less volatile in the face of certain economic shocks, such as in terms of output adjustment. We re-estimate our baseline equation by excluding countries such as Brazil, Mexico, India, and Turkey as diversified economies. The results from this re-estimation (see Table 3) are consistent with the baseline results. We find that structural reforms still have a positive effect on labour productivity growth in the medium term.

Table 3: ATE of structural reforms on labour productivity growth

	(1) year(t+1)	(2) year(t+2)	(3) year(t+3)	(4) year(t+4)	(5) year(t+5)
ATE u wts: Aggregate reforms	0.34	0.46	1.21*	1.17***	0.87*
	(0.37)	(0.64)	(0.59)	(0.33)	(0.46)
Observations	347	347	347	347	347
ATE u wts: Trade reforms	0.49	1.41***	0.52	0.72	1.59***
	(0.59)	(0.48)	(0.48)	(0.66)	(0.42)
Observations	347	347	347	347	347
ATE u wts: Financial reforms	0.39	0.86**	1.09*	0.97**	0.87***
	(0.39)	(0.33)	(0.53)	(0.35)	(0.26)
Observations	347	347	347	347	347
ATE u wts: Product market reforms	-0.67	-0.60	0.19	1.21*	0.58*
	(0.54)	(0.70)	(0.88)	(0.59)	(0.21)
Observations	347	347	347	347	347

Note: Driscoll-Kraay standard errors in parentheses. *** p≤0.01, ** p≤0.05, * p≤0.1. Additional controls: 2 lag of unemployment, total (% of total labour force); 1 lag of dependent variable; dummy variable for year of a banking, currency, inflation, or debt crisis from Laeven and Valencia (2020); country and year fixed effects are also included. Propensity score based on the probit model as described in the text includes: GDP growth (annual %); ICRG indicator of quality of government; unemployment, total (% of total labour force); IMF programme; commodity terms of trade; legislative election dummy; age dependency ratio. All variables are in lag. IPWRA estimates do not impose restrictions on the weights of the propensity score.

Source: author's calculations based on study data.

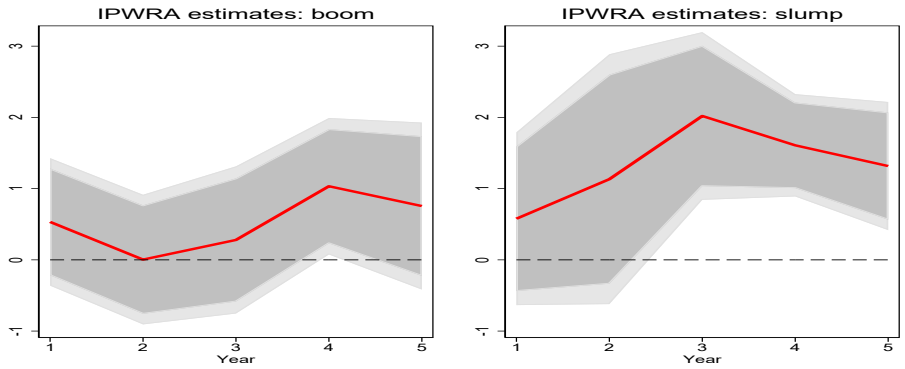
5.2 State dependent

Our previous results show that reforms have a positive medium-term impact on the growth rate of labour productivity. However, the impact of reforms can be very different in a downturn than in an upturn. Thus, in line with the empirical evidence, we consider three factors that could potentially lead to different impulse responses of structural reforms, namely the business cycle, credit cycle, and financial crises.

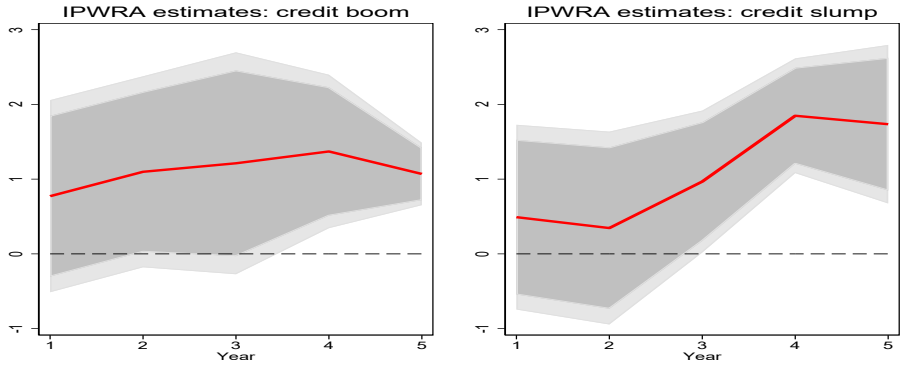
To take these factors into account, we leverage one of the advantages of the local projection model, which easily accommodates the treatment of nonlinearity and state dependence. The identification of the business cycle was performed using the filter of Hamilton (2018) on the logarithm of GDP per capita.[6] The business cycle is then characterized by a dummy variable taking the value 1 in the event of economic expansion and 0 in a period of recession. As for the credit cycle, we use the same approach based on domestic credit to the private sector (per cent of GDP).

Figure 3: Effects of structural reforms on labour productivity: initial conditions

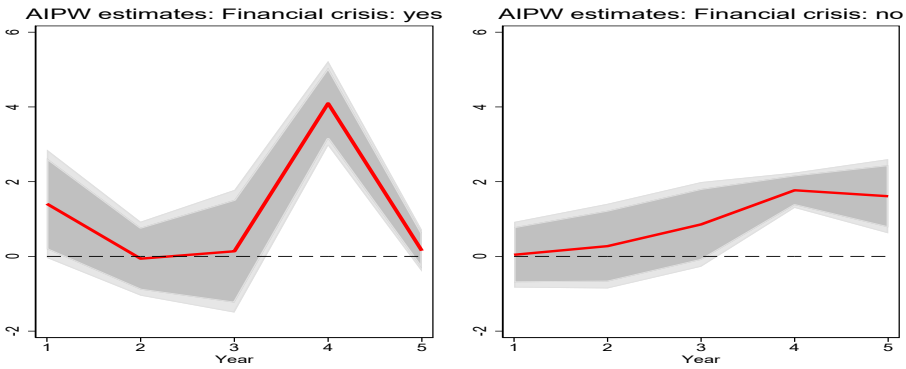
(a) Business cycle



(b) Financial crisis



(c) Credit cycle



Note: shaded areas: 95% and 90% confidence intervals constructed with robust standard errors.

Source: author's illustration based on study data.

[6] Empirical evidence generally uses the filter of Hodrick and Prescott (1997). This filter requires the choice of a parameter that deserves to be discussed. Our approach uses the alternative method proposed by Hamilton (2018), which does not require the choice of a parameter and does not condition the results to the value of the chosen parameter.

Figure 3 presents the impulse responses across the different states. The graphs show that the impact of structural reform shocks on labour productivity growth is not affected by the business cycle, the credit cycle, or the occurrence or non-occurrence of financial crises. To ensure that there is no significant difference in the estimated effects of different states, we present in Table 4 the Wald test for each regime and the corresponding p value. The results indicate that the responses in the respective regimes are not significantly different from each other.

Table 4: Wald Chi-squared test of the difference of the reforms shock between two states

State:	Business cycle: boom/slump	Credit boom/slump	Financial crises yes/no
chi2 Year 5	0.64	0.56	2.73
Pro Year 5	0.63	0.46	0.11

Note: we only present the results for the aggregate reforms.

Source: author's calculations based on study data.

6 Concluding remarks

In recent decades, structural policies have become a general policy line in many countries. With the global economy increasingly buffeted by crises, the room for manoeuvre for traditional macroeconomic policies remains limited. To promote sustainable and inclusive growth, policy-makers have increasingly turned to structural policy reforms. Thus, for policy-makers and the academic research community, knowing the effects of such policies on macroeconomic outcomes is of paramount importance.

This paper quantifies the impact of structural reforms (trade, financial, and product market reforms) on labour productivity growth while documenting the main channels. It uses a rich database on structural reforms constructed by Alesina et al. (2020) as well as a sectoral database, the Economic Transformation Database (ETD) constructed by UNU-WIDER. To obtain robust estimates, the article calls for the use of sophisticated estimation techniques based on a combination of local projection methods and inverse probability weighted regression adjustment (LP-IPWRA) à la Jordà and Taylor (2016).

The results clearly show that the three reforms studied play a crucial role in improving productivity in developing countries. To identify the channels through which reforms affect productivity growth, the paper decomposes labour productivity into two components: intrasectoral growth and intersectoral growth (structural change). While our estimates reveal that reforms have a positive impact on intrasectoral productivity growth, they show that structural reforms do not encourage structural change in developing countries. Taking into account the initial conditions, the results are robust to the baseline estimates. Indeed, the impact of the reforms does not differ significantly if we take into account the business cycle, the onset of a financial crisis, or a credit boom.

These results have important policy implications for developing countries. In order to achieve Sustainable Development Goal 8, which is based on diversification, innovation, and improvement of labour productivity, policy-makers in developing countries can adopt three reform packages: continue efforts to liberalize international trade by removing tariff barriers; make the market for services and products competitive by removing monopolies, entry barriers, and supervision and regulation; and develop the financial market by limiting credit and interest rate controls while promoting the development of securities markets.

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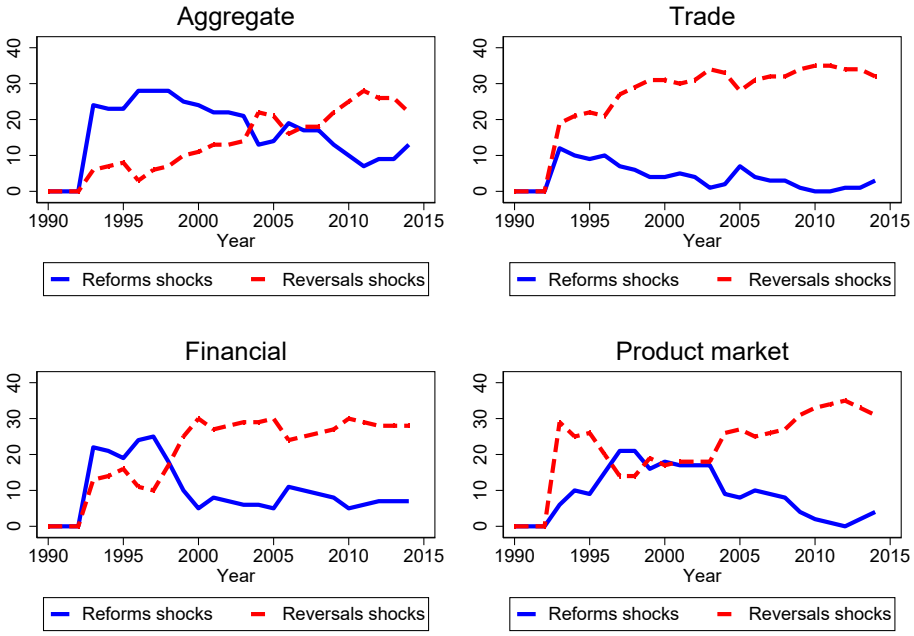
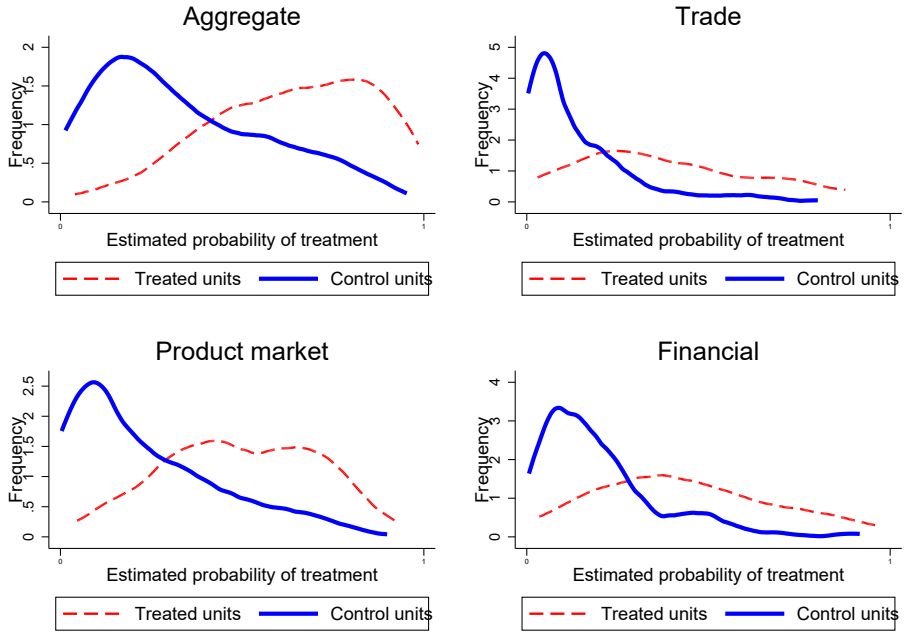
A1 Appendix

Figure A1: Number of reforms and reversals shocks



Source: author's illustration based on study data.

Figure A2: Overlap check: empirical distributions of the treatment propensity score



Source: author's illustration based on study data.

Table A1: Balance check

	Aggregate reform | diff.
Dummy variable for year of a banking, currency, or debt crisis	0.20***(0.04)
Age dependency ratio (% of working-age pop.)	0.79(1.32)
GDP growth (annual %)	0.15(0.25)
IMF programme	0.02(0.04)
ICRG indicator of quality of government	0.03***(0.01)
Commodity terms of trade	0.52(0.40)
1 if there was a legislative election in this year	-0.04 (0.03)
Unemployment, total (% of total labour force) (modeled ILO)	0.35(0.41)
Aggregate	0.64***(0.03)
Observations	751
	Trade reform | diff.
Dummy variable for year of a banking, currency, or debt crisis	0.07(0.04)
Age dependency ratio (% of working-age pop.)	-0.32(1.38)
GDP growth (annual %)	0.63**(0.26)
IMF programme	-0.02(0.04)
ICRG indicator of quality of government	0.03***(0.01)
Commodity terms of trade	1.43***(0.41)
1 if there was a legislative election in this year	-0.03(0.03)
Unemployment, total (% of total labour force) (modeled ILO)	-0.51(0.43)
Trade	0.56***(0.03)
Observations	753
	Product market reform | diff.
Dummy variable for year of a banking, currency, or debt crisis	0.17***(0.04)
Age dependency ratio (% of working-age pop.)	1.65(1.45)
GDP growth (annual %)	-0.67**(0.27)
IMF programme	-0.02(0.04)
ICRG indicator of quality of government	-0.01(0.01)
Commodity terms of trade	-0.48(0.40)
1 if there was a legislative election in this year	0.01(0.04)
Unemployment, total (% of total labour force) (modeled ILO)	0.81*(0.46)
Product market	0.65***(0.03)
Observations	611
	Financial reform | diff.
Dummy variable for year of a banking, currency, or debt crisis	0.10**(0.04)
Age dependency ratio (% of working-age pop.)	1.23(1.32)
GDP growth (annual %)	0.15(0.25)
IMF programme	-0.04(0.04)
ICRG indicator of quality of government	0.03***(0.01)
Commodity terms of trade	0.43(0.39)
1 if there was a legislative election in this year	-0.05(0.03)
Unemployment, total (% of total labour force) (modeled ILO)	-0.13(0.40)
Financial	0.61***(0.03)
Observations	770

Source: author's calculations based on study data.

Table A2: Reform treatment regression, pooled probit estimators

	(1)	(2)	(3)	(4)
Dummy variable for year of a banking, currency, or debt crisis	0.159*	0.016	0.146***	0.081
	(0.091)	(0.068)	(0.055)	(0.084)
Age dependency ratio (% of working-age pop.)	0.006*	-0.001	0.005	0.001
	(0.003)	(0.003)	(0.004)	(0.004)
GDP growth (annual %)	0.014	0.017*	-0.009	0.011
	(0.010)	(0.010)	(0.006)	(0.010)
IMF programme	-0.009	-0.052	-0.014	-0.064
	(0.082)	(0.062)	(0.083)	(0.081)
ICRG indicator of quality of government	0.669**	0.541**	-0.156	0.620**
	(0.266)	(0.220)	(0.395)	(0.298)
Commodity terms of trade	-0.000	-0.001	0.001	-0.004
	(0.005)	(0.007)	(0.005)	(0.005)
1 if there was a legislative election in this year	-0.106**	-0.051	-0.017	-0.106**
	(0.041)	(0.051)	(0.045)	(0.049)
Unemployment, total (% of total labor force) (modeled ILO)	0.004	0.000	0.010*	0.001
	(0.005)	(0.004)	(0.006)	(0.005)
Observations	447	447	405	447
Model AUC	0.814	0.831	0.813	0.802

Note: standard errors in parentheses. *** p≤0.01, ** p≤0.05, * p≤0.1. Column (1) indicates aggregate reforms, (2) trade reforms, (3) product market reforms, and (4) financial reforms.

Source: author's calculations based on study data.

Table A3: Countries list

Emerging market economies (EMs)	Low-income countries (LICs)
Argentina; Bolivia; Brazil; Chile; China; Colombia; Costa Rica; Ecuador; Egypt; India; Indonesia; Malaysia; Mexico; Morocco; Pakistan; Peru; Philippines; South Africa; Sri Lanka; Thailand; Tunisia; Turkey	Bangladesh; Burkina Faso; Cameroon; Ethiopia; Ghana; Kenya; Mozambique; Nepal; Nigeria; Senegal; Tanzania; Uganda; Vietnam

Source: author's calculations based on study data.

Table A4: Definitions and sources for selected variables

Variables	Definition	Sources
Structural reforms index	See main text	Alesina et al. (2020) and author calculations
Labor productivity (and its component)	See main text	GGDC/UNU-WIDER (ETD) and author calculations
Inflation	Inflation rate, average consumer prices (annual per cent change)	WEO
Unemployment rate	Unemployment rate (per cent of total labour force)	WEO
Growth rate	GDP growth (annual %)	WDI
IMF-supported programmes	Dummy equal to one for countries that signed an IMF-supported programme in the previous five-year period and zero otherwise	Balima and Sy (2019)
Institutional quality	Indicator of quality of government	ICRG
Trade	Sum of exports and imports of goods and services measured as a share of GDP	WDI
Government size	General government final consumption expenditure (% of GDP)	WDI
Female labour participation	Labour force, female (% of total labour force)	WDI
Sectoral composition of output	Agriculture, forestry, and fishing, value added (% of GDP)	WDI
Crises dummy	Dummy variable for year of a banking, currency, or debt crisis	Laeven and Valencia (2020)
GDP per capita	GDP per capita, constant 2010 US dollar	WDI

Source: author's compilation based on study data.

Table A5: Sector cover in the study

ISIC Rev. 4 code	ETD sector name	ISIC Rev. 4 description
A	Agriculture	Agriculture, forestry, fishing
B	Mining	Mining and quarrying
C	Manufacturing	Manufacturing
D+E	Utilities	Electricity, gas, steam, and air conditioning supply; water supply; sewerage, waste management, and remediation activities
F	Construction	Construction
G+I	Trade services	Wholesale and retail trade; repair of motor vehicles and motorcycles; accommodation and food service activities
H	Transport services	Transportation and storage
J+M+N	Business services	Information and communication; professional, scientific, and technical activities; administrative and support service activities
K	Financial services	Financial and insurance activities
L	Real estate	Real estate activities
O+P+Q	Government services	Public administration and defence; compulsory social security; education; human health and social work activities
R+S+T+U	Other services	Arts, entertainment, and recreation; other service activities; activities of households as employers; undifferentiated goods- and services-producing activities of households for own use; activities of extraterritorial organizations and bodies